VOLUME 18 / NUMBER 10
MAY 23, 1980
ACC. NOS. N80-19021 TO N80-20022

STAR
AN ABSTRACT JOURNAL

Scientific and Technical Aerospace Reports

PRODUCED BY THE
SCIENTIFIC AND TECHNICAL
INFORMATION
BRANCH

NASA

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WHAT YOU CAN DO FOR *STAR*

All users of this abstract service are urged to forward reports to be considered for announcement in *STAR*. This will aid NASA in its efforts to provide the fullest possible coverage of all scientific and technical publications that might support aeronautics and space research and development. If you have prepared relevant reports (other than those that you will transmit to NASA, DoD, or DOE through the usual contract- or grant-reporting channels), please send them for consideration to the NASA Scientific and Technical Information Facility, P. O. Box 8757, B. W. I. Airport, Maryland 21240.

Reprints of journal articles, book chapters, and conference papers are also welcome. These will be considered for announcement in *STAR's* companion journal, *International Aerospace Abstracts*.

You may specify a particular source to be included in a report announcement if you wish; otherwise the report will be placed on public sale at the National Technical Information Service. Copyrighted publications will be announced but not distributed or sold.

PURCHASE OF *STAR*

The semimonthly issues and the cumulative index issues are available postpaid on subscription and in single copy from the Superintendent of Documents, United States Government Printing Office, Washington, D.C., 20402, United States of America.

Semimonthly issues...

Annual subscription rates: $60.00 domestic; $75.00 foreign. Price per single copy: $2.50 domestic; $3.15 foreign.

Cumulative index issues, semiannual and annual...

Annual subscription rates for both: $25.00 domestic; $31.25 foreign. Price per single copy: semiannual $9.50 domestic, $11.90 foreign; annual $16.00 domestic, $20.00 foreign.

Domestic subscription rates...

Apply to the United States, Canada, Mexico, and all Central and South American countries, except as noted below.

Foreign subscription rates...

Apply to Argentina, Brazil, French Guiana, Guyana, Surinam, Belize, and all other countries throughout the world.

Payment should be by check, money order, or document coupons, and must accompany order. Remittances from foreign countries should be made by international money order or draft on an American bank, payable to the Superintendent of Documents, or by UNESCO book coupons.

PUBLISHED BY:

UNITED STATES GOVERNMENT
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SCIENTIFIC AND TECHNICAL INFORMATION BRANCH
Scientific and Technical Aerospace Reports, Volume 18, is prepared by the NASA Scientific and Technical Information Facility operated for the National Aeronautics and Space Administration by Informatics Information Systems Company.

The Administrator of the National Aeronautics and Space Administration has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Agency. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through June 30, 1981.

US ISSN 0036-8741

INTRODUCTION

Scientific and Technical Aerospace Reports (STAR) is a major component of a comprehensive National Aeronautics and Space Administration information system covering aeronautics, space, and supporting disciplines. *STAR* is issued on the 8th and 23rd of each month and announces current publications of the following types:

- NASA, NASA contractor, and NASA grantee reports
- Reports issued by other U.S. Government agencies, domestic and foreign institutions, universities, and private firms
- Translations in report form
- NASA-owned patents and patent applications
- Dissertations and theses

Cumulative index volumes are published semiannually and annually.

Journal, book, and conference literature, cover-to-cover journal translations, and certain foreign dissertations are announced in a companion journal, *International Aerospace Abstracts (IAA)*, available on subscription from the American Institute of Aeronautics and Astronautics, Technical Information Service, 555 West 57th Street, 12th Floor, New York, New York 10019.

ON-GOING RESEARCH PROJECTS

By arrangement between NASA and the Smithsonian Science Information Exchange (SSIE), a separate section of information on aerospace-related *On-Going Research Projects* is inserted into each issue of *STAR*. The insert presents titles of active NASA grants and university contracts, summary portions of recently updated *NASA Research and Technology Objectives and Plans (RTOPs)*, and notices of non-NASA research projects that were funded in the most recent or current fiscal year. The latter are selected by SSIE. The project announcements in the insert are arranged by *STAR* divisions but are otherwise entirely separate from *STAR*. They are not indexed nor machine-searchable by NASA. Current and retrospective searches are available from SSIE, 1730 M Street, N.W., Washington, D.C. 20036.

SUBJECT SCOPE

Subject scope of *STAR*, *IAA*, and *On-Going Research Projects* includes all aspects of aeronautics and space research and development, supporting basic and applied research, and applications. Aerospace aspects of earth resources, energy development, conservation, oceanography, environmental protection, urban transportation, and other topics of high national priority are also covered.

OTHER NASA PUBLICATIONS

Other NASA publications and information services are described in the publication, *The NASA Scientific and Technical Information System ... and How to Use It*, available without charge from the NASA Scientific and Technical Information Facility, P. O. Box 8757, B. W. I. Airport, Maryland 21240.

HOW TO USE STAR SUBJECT CATEGORIES

STAR is categorized by 10 major subject divisions divided into 74 specific subject categories and one general category/division. The major subject divisions are listed in the Table of Contents, together with a note for each that defines its scope and provides any cross-references. For example:

AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

Each major division is further divided into as many as nine specific categories, which are identified by category numbers.

Abstracts in *STAR* are grouped by specific category, the categories appearing in sequential order. Category breaks in the abstract section are identified by the category number and title, and a scope note. Cross-references to other categories are provided as appropriate. For example:

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*.

CROSS-REFERENCES

Individual *STAR* abstracts are not ordinarily cross-referenced, except for certain conference reports or book translations that have had separate abstracts written for their component papers or chapters. Citations and abstracts of the components follow immediately after those of the parent document. When the subject content of a component differs sufficiently from the general content of the parent, a cross-reference citation also is printed at the end of the category to which it normally would have been assigned if it were independent.

DOCUMENTS ON MICROFICHE

Documents on microfiche[1] are designated by a pound sign (#) following the accession number. The pound sign is used without regard to the source or quality of the microfiche.

AVAILABILITIES

One or more sources from which a document announced in *STAR* is available to the public is given in each citation. The most commonly indicated sources and their acronyms or abbreviations are listed below. If the publication is available from a source other than those listed, the publisher and his address will be displayed on the availability line or in combination with the corporate source line.

(1) A microfiche is a transparent sheet of film, 105 by 148 mm in size, containing as many as 60 to 98 pages of information reduced to micro images (not to exceed 26:1 reduction).

Avail: NTIS. Sold by the National Technical Information Service. Prices for hard copy (HC) and microfiche (MF) are indicated by a price code following the letters HC or MF in the *STAR* citation. Current values for the price codes are given in the tables on page vii.

Initially distributed microfiche under the NTIS SRIM (Selected Research in Microfiche) is available at greatly reduced unit prices. For this service and for information concerning subscription to NASA printed reports, consult the NTIS Subscription Section, Springfield, Va. 22161.

NOTE ON ORDERING DOCUMENTS: When ordering NASA publications (those followed by the * symbol), use the N accession number. NASA patent applications (only the specifications are offered) should be ordered by the US-Patent-Appl-SN number. Non-NASA publications (no asterisk) should be ordered by the AD, PB, or other *report* number shown on the last line of the citation, not by the N accession number. It is also advisable to cite the title and other bibliographic identification.

Avail: SOD (or GPO). Sold by the Superintendent of Documents, U.S. Government Printing Office, in hard copy. The current price and order number are given following the availability line. (NTIS will fill microfiche requests, at the standard $3.50 price, for those documents identified by a # symbol.)

Avail: NASA Public Document Rooms. Documents so indicated may be examined at or purchased from the National Aeronautics and Space Administration, Public Documents Room (Room 126), 600 Independence Ave., S.W., Washington, D.C. 20546, or public document rooms located at each of the NASA research centers, the NASA Space Technology Laboratories, and the NASA Pasadena Office at the Jet Propulsion Laboratory.

Avail: DOE Depository Libraries. Organizations in U.S. cities and abroad that maintain collections of Department of Energy reports, usually in microfiche form, are listed in *Energy Research Abstracts*. Services available from the DOE and its depositories are described in a booklet, *DOE Technical Information Center - Its Functions and Services* (TID-4660), which may be obtained without charge from the DOE Technical Information Center.

Avail: Univ. Microfilms. Documents so indicated are dissertations selected from *Dissertation Abstracts* and are sold by University Microfilms as xerographic copy (HC) and microfilm. All requests should cite the author and the Order Number as they appear in the citation.

Avail: USGS. Originals of many reports from the U.S. Geological Survey, which may contain color illustrations, or otherwise may not have the quality of illustrations preserved in the microfiche or facsimile reproduction, may be examined by the public at the libraries of the USGS field offices whose addresses are listed in this Introduction. The libraries may be queried concerning the availability of specific documents and the possible utilization of local copying services, such as color reproduction.

Avail: HMSO. Publications of Her Majesty's Stationery Office are sold in the U.S. by Pendragon House, Inc. (PHI), Redwood City, California. The U.S. price (including a service and mailing charge) is given, or a conversion table may be obtained from PHI.

Avail: BLL (formerly NLL): British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England. Photocopies available from this organization at the price shown. (If none is given, inquiry should be addressed to the BLL)

Avail: Fachinformationszentrum, Karlsruhe. Sold by the Fachinformationszentrum Energie, Physik, Mathematik GMBH, Eggenstein Leopoldshafen, Federal Republic of Germany, at the price shown in deutschmarks (DM).

Avail: Issuing Activity, or Corporate Author, or no indication of availability. Inquiries as to the availability of these documents should be addressed to the organization shown in the citation as the corporate author of the document.

Avail: U.S. Patent and Trademark Office. Sold by Commissioner of Patents and Trademarks, U.S. Patent and Trademark Office, at the standard price of 50 cents each, postage free. (See discussion of patents and patent applications below.)

NASA PATENTS AND PATENT APPLICATIONS

Patents and patent applications owned by NASA are announced in *STAR* under appropriate subject categories and are referenced in the *STAR* indexes. In the Report/Accession Number Index, patents are indexed by the NASA Case Number (which appears in lieu of the report number in other indexes), the U.S. Patent Number, the U.S. Patent Application Serial Number, and the U.S. Patent Class. Patent applications for which patents have not yet been issued are indexed by the NASA Case Number and the U.S. Patent Application Serial Number.

NASA *patent application specifications* are sold in paper copy by the National Technical Information Service at price code A02 ($5.00 domestic; $10.00 foreign). Microfiche are sold at price code A01 ($3.50 domestic; $5.25 foreign). The US-Patent-Appl-SN- number should be used in ordering either paper copy or microfiche from NTIS. Printed copies of *patents* (which are not microfiched) are available for purchase at 50 cents per copy from:

Commissioner of Patents and Trademarks
U.S. Patent and Trademark Office
Washington, D.C. 20231

When ordering patents, the U.S. Patent Number should be used, and payment must be remitted *in advance, preferably by money order or check payable to the Commissioner of Patents and* Trademarks. Prepaid purchase coupons for ordering are also available from the Patent and *Trademark Office. The patents and patent applications announced in STAR* are owned by NASA and are available for royalty-free licensing. Requests for licensing terms and further *information should be addressed to:*

Assistant General Counsel for Patent Matters/Code GP-1
National Aeronautics and Space Administration
Washington, D.C. 20546

ELIGIBILITY AND REGISTRATION FOR NASA INFORMATION PRODUCTS AND SERVICES

A variety of services, in addition to the distribution of NASA scientific and technical reports and of STAR and its cumulative indexes, is available to organizations of the following types that have registered with NASA to receive specific services or products:

1. NASA offices, research centers, contractors, subcontractors, grantees, and consultants;

2. Other U.S. Government agencies and their contractors;
3. Libraries in the United States that have arrangements with NASA to maintain collections of NASA documents for public reference;
4. Other organizations in the United States having a need for NASA documents in work related to aeronautics and space research;
5. Organizations abroad that have established reciprocal document exchange arrangements with NASA.

Only the central service points or central points of document acquisition and control within qualified organizations are eligible to register for NASA products and services. Domestic organizations that may be eligible to receive various classes of NASA publications and services should address their requests for registration or for further information to:

NASA Scientific and Technical Information Facility
Attn.: Registration Activity
P.O. Box 8757
B.W.I. Airport, Maryland 21240

Organizations abroad should direct requests to the same address, but to the attention of: International Exchange Program.

AVAILABILITY OF STAR ABSTRACTS ON MICROFICHE

Microfiche of the abstract sections of this issue ahd other issues of *STAR* are available on annual subscription from NTIS, Attn: Subscriptions, 5285 Port Royal Road, Springfield, Virginia 22161. Annual subscription rates are $45.00 North America; $90.00 foreign. Abstract sections for previous years retroactive to 1964 are available at the current rates. Microfiche for individual *STAR* issue abstract sections are not available.

ADDRESSES OF ORGANIZATIONS

American Institute of Aeronautics and Astronautics
Technical Information Service
555 West 57th Street, 12th Floor
New York, New York 10019

British Library Lending Division,
Boston Spa, Wetherby, Yorkshire,
England

Commissioner of Patents and Trademarks
U.S. Patent and Trademark Office
Washington, D.C. 20231

Department of Energy
Technical Information Center
P.O. Box 62
Oak Ridge, Tennessee 37830

ESA-Information Retrieval Service
ESRIN
Via Galileo Galilei
00044 Frascati (Rome) Italy

Her Majesty's Stationery Office
P.O. Box 569, S.E. 1
London, England

NASA Scientific and Technical Information Facility
P.O. Box 8757
B. W. I. Airport, Maryland 21240

National Aeronautics and Space Administration
Scientific and Technical Information Branch (NST-41)
Washington, D.C. 20546

National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161

Pendragon House, Inc.
899 Broadway Avenue
Redwood City, California 94063

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

University Microfilms
A Xerox Company
300 North Zeeb Road
Ann Arbor, Michigan 48106

University Microfilms, Ltd.
Tylers Green
London, England

U.S. Geological Survey
1033 General Services Administration Building
Washington, D.C. 20242

U.S. Geological Survey
601 E. Cedar Avenue
Flagstaff, Arizona 86002

U.S. Geological Survey
345 Middlefield Road
Menlo Park, California 94025

U.S. Geological Survey
Bldg. 25, Denver Federal Center
Denver, Colorado 80225

Fachinformationszentrum Energie, Physik, Mathematik GMBH
7514 Eggenstein Leopoldshafen
Federal Republic of Germany

NTIS PRICE SCHEDULES

Schedule A
STANDARD PAPER COPY PRICE SCHEDULE

(Effective January 1, 1980)

Price Code	Page Range	North American Price	Foreign Price
A01	Microfiche	$ 3.50	$ 5.25
A02	001-025	6.00	10.00
A03	026-050	8.00	12.00
A04	051-075	7.00	14.00
A05	076-100	8.00	16.00
A06	101-125	9.00	18.00
A07	126-150	10.00	20.00
A08	151-175	11.00	22.00
A09	176-200	12.00	24.00
A10	201-225	13.00	26.00
A11	226-250	14.00	28.00
A12	251-275	15.00	30.00
A13	276-300	16.00	32.00
A14	301-325	17.00	34.00
A15	326-350	18.00	36.00
A16	351-375	19.00	38.00
A17	376-400	20.00	40.00
A18	401-425	21.00	42.00
A19	426-450	22.00	44.00
A20	451-475	23.00	46.00
A21	476-500	24.00	48.00
A22	501-525	25.00	50.00
A23	526-550	26.00	52.00
A24	551-575	27.00	54.00
A25	576-600	28.00	56.00
A99	601-up	- 1/	- 2/

1/ Add $1.00 for each additional 25 page increment or portion thereof for 601 pages up.

2/ Add $2.00 for each additional 25 page increment or portion thereof for 601 pages and more.

Schedule E
EXCEPTION PRICE SCHEDULE
Paper Copy & Microfiche

Price Code	North American Price	Foreign Price
E01	$ 5.50	$ 11.50
E02	6.50	13.50
E03	8.50	17.50
E04	10.50	21.50
E05	12.50	25.50
E06	14.50	29.50
E07	16.50	33.50
E08	18.50	37.50
E09	20.50	41.50
E10	22.50	45.50
E11	24.50	49.50
E12	27.50	55.50
E13	30.50	61.50
E14	33.50	67.50
E15	36.50	73.50
E16	39.50	79.50
E17	42.50	85.50
E18	45.50	91.50
E19	50.50	100.50
E20	60.50	121.50
E99	- Write for quote	
N01	28.00	40.00

VOLUME 18 NUMBER 10/MAY 23, 1980

TABLE OF CONTENTS

AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

01 AERONAUTICS (GENERAL) 1229

02 AERODYNAMICS 1230

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*.

03 AIR TRANSPORTATION AND SAFETY 1233

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION 1234

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command and Tracking* and *32 Communications*.

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE 1235

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.

06 AIRCRAFT INSTRUMENTATION 1241

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

07 AIRCRAFT PROPULSION AND POWER 1242

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

08 AIRCRAFT STABILITY AND CONTROL 1245

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

09 RESEARCH AND SUPPORT FACILITIES (AIR) 1246

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

ASTRONAUTICS

Includes astronautics (general); astrodynamics; ground support systems and facilities (space); launch vehicles and space vehicles; space transportation; spacecraft communications, command and tracking; spacecraft design, testing and performance; spacecraft instrumentation; and spacecraft propulsion and power.

For related information see also *Aeronautics*.

12 ASTRONAUTICS (GENERAL) 1247

For extraterrestrial exploration see *91 Lunar and Planetary Exploration*.

13 ASTRODYNAMICS 1248

Includes powered and free-flight trajectories; and orbit and launching dynamics.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE) 1248

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research and Support Facilities (Air)*.

15 LAUNCH VEHICLES AND SPACE VEHICLES 1248

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

16 SPACE TRANSPORTATION 1252

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation*.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING 1252

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE 1253

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

19 SPACECRAFT INSTRUMENTATION N.A.

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

20 SPACECRAFT PROPULSION AND POWER 1253

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion and Power*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

CHEMISTRY AND MATERIALS

Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; and propellants and fuels.

23 CHEMISTRY AND MATERIALS (GENERAL) 1254

Includes biochemistry and organic chemistry.

24 COMPOSITE MATERIALS 1254

Includes laminates.

25 INORGANIC AND PHYSICAL CHEMISTRY 1257

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics*.

26 METALLIC MATERIALS 1259

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

27 NONMETALLIC MATERIALS 1264

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

28 PROPELLANTS AND FUELS 1267

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power*, *20 Spacecraft Propulsion and Power*, and *44 Energy Production and Conversion*.

ENGINEERING

Includes engineering (general); communications; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.

For related information see also *Physics*.

31 ENGINEERING (GENERAL) 1271

Includes vacuum technology; control engineering; display engineering; and cryogenics.

32 COMMUNICATIONS 1272

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking*.

33 ELECTRONICS AND ELECTRICAL ENGINEERING 1286

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

34 FLUID MECHANICS AND HEAT TRANSFER 1290

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

35 INSTRUMENTATION AND PHOTOGRAPHY 1293

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation* and *19 Spacecraft Instrumentation*.

36 LASERS AND MASERS 1294

Includes parametric amplifiers.

37 MECHANICAL ENGINEERING 1296

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

38 QUALITY ASSURANCE AND RELIABILITY 1299

Includes product sampling procedures and techniques; and quality control.

39 STRUCTURAL MECHANICS 1305

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

GEOSCIENCES

Includes geosciences (general); earth resources; energy production and conversion; environment pollution; geophysics; meteorology and climatology; and oceanography.

For related information see also *Space Sciences*.

42 GEOSCIENCES (GENERAL) N.A.

43 EARTH RESOURCES 1308
Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see *35 Instrumentation and Photography*.

44 ENERGY PRODUCTION AND CONVERSION 1311
Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.
For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation*.

45 ENVIRONMENT POLLUTION 1318
Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

46 GEOPHYSICS 1321
Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.
For space radiation see *93 Space Radiation*.

47 METEOROLOGY AND CLIMATOLOGY 1323
Includes weather forecasting and modification.

48 OCEANOGRAPHY 1329
Includes biological, dynamic and physical oceanography; and marine resources.

LIFE SCIENCES

Includes life sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and planetary biology.

51 LIFE SCIENCES (GENERAL) 1329
Includes genetics.

52 AEROSPACE MEDICINE 1334
Includes physiological factors; biological effects of radiation; and weightlessness.

53 BEHAVIORAL SCIENCES 1336
Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT 1337
Includes human engineering; biotechnology; and space suits and protective clothing.

55 PLANETARY BIOLOGY N.A.
Includes exobiology; and extraterrestrial life.

MATHEMATICAL AND COMPUTER SCIENCES

Includes mathematical and computer sciences (general); computer operations and hardware; computer programming and software; computer systems; cybernetics; numerical analysis; statistics and probability; systems analysis; and theoretical mathematics.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL) 1339

60 COMPUTER OPERATIONS AND HARDWARE 1344
Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering*.

61 COMPUTER PROGRAMMING AND SOFTWARE 1346
Includes computer programs, routines, and algorithms.

62 COMPUTER SYSTEMS 1350
Includes computer networks.

63 CYBERNETICS 1350
Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support*.

64 NUMERICAL ANALYSIS 1351
Includes iteration, difference equations, and numerical approximation.

65 STATISTICS AND PROBABILITY 1353
Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

66 SYSTEMS ANALYSIS 1354
Includes mathematical modeling; network analysis; and operations research.

67 THEORETICAL MATHEMATICS 1356
Includes topology and number theory.

PHYSICS

Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy physics; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.
For related information see also *Engineering*.

70 PHYSICS (GENERAL) N.A.
For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar Physics*.

71 ACOUSTICS 1356
Includes sound generation, transmission, and attenuation.
For noise pollution see *45 Environment Pollution*.

72 ATOMIC AND MOLECULAR PHYSICS 1356
Includes atomic structure and molecular spectra.

73 NUCLEAR AND HIGH-ENERGY PHYSICS 1357
Includes elementary and nuclear particles; and reactor theory.
For space radiation see *93 Space Radiation*.

74 OPTICS 1358
Includes light phenomena.

75 PLASMA PHYSICS 1360
Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

76 SOLID-STATE PHYSICS 1361
Includes superconductivity.
For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers*.

77 THERMODYNAMICS AND STATISTICAL PHYSICS 1363
Includes quantum mechanics; and Bose and Fermi statistics.
For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer*.

SOCIAL SCIENCES

Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law and political science; and urban technology and transportation.

80 SOCIAL SCIENCES (GENERAL) 1363
Includes educational matters.

81 ADMINISTRATION AND MANAGEMENT 1363
Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE 1364
Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software*.

83 ECONOMICS AND COST ANALYSIS N.A.
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE 1365
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 1365
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion*.

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences*.

88 SPACE SCIENCES (GENERAL) N.A.

89 ASTRONOMY 1366
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 1366
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 1367
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

92 SOLAR PHYSICS 1367
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 1367
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

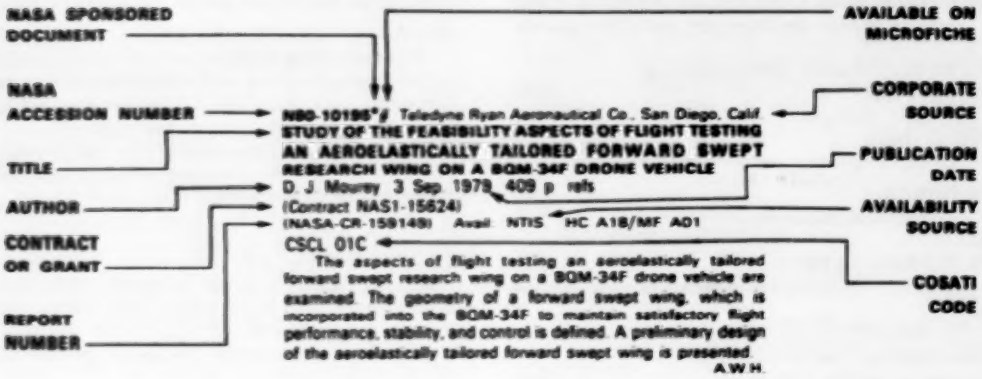
GENERAL

99 GENERAL 1367

Note: N.A. means that no abstracts were assigned to this category for this issue.

SUBJECT INDEX I-1
PERSONAL AUTHOR INDEX I-55
CORPORATE SOURCE INDEX I-63
CONTRACT NUMBER INDEX I-77
REPORT/ACCESSION NUMBER INDEX I-81

TYPICAL CITATION AND ABSTRACT


NASA SPONSORED DOCUMENT
AVAILABLE ON MICROFICHE
NASA ACCESSION NUMBER
N80-10195*# Teledyne Ryan Aeronautical Co., San Diego, Calif.
CORPORATE SOURCE
TITLE
STUDY OF THE FEASIBILITY ASPECTS OF FLIGHT TESTING AN AEROELASTICALLY TAILORED FORWARD SWEPT RESEARCH WING ON A BQM-34F DRONE VEHICLE
PUBLICATION DATE
AUTHOR
D. J. Mourey 3 Sep. 1979 409 p refs
(Contract NAS1-15624)
AVAILABILITY SOURCE
CONTRACT OR GRANT
(NASA-CR-159149) Avail: NTIS HC A18/MF A01
CSCL 01C
COSATI CODE
REPORT NUMBER
The aspects of flight testing an aeroelastically tailored forward swept research wing on a BQM-34F drone vehicle are examined. The geometry of a forward swept wing, which is incorporated into the BQM-34F to maintain satisfactory flight performance, stability, and control is defined. A preliminary design of the aeroelastically tailored forward swept wing is presented.
A.W.H.

ON-GOING RESEARCH PROJECTS

This is a listing of research projects - not publications

AERONAUTICS

Includes Aeronautics (general); Aerodynamics; Air Transportation and Safety; Aircraft Communications and Navigation; Aircraft Design, Testing, and Performance; Aircraft Instrumentation; Aircraft Propulsion and Power; Aircraft Stability and Control; and Research and Support Facilities (air). For Related Information See Also Astronautics.

1.0001, APPLICATION OF SUPERHARD TRANSPARENT COATING TO HELICOPTER WINDSHIELDS

G. Wintermute, Goodyear Aerospace Corp., *Litchfield Park, Arizona* 85340 (DA0E3852; DAAK51 78 C 0024)

The objective is the Army Field Service evaluation of 10 UH-1 helicopter windshields coated with a superhard transparent coating for windshield surface abrasion protection.

The approach is to process (fabricate and coat) the 10 UH-1 helicopter righthand windshields with Goodyear Aerospace Corporation No. 211 coating (developed by Goodyear Aerospace Corporation under Army contract DAAj02-76-C-0004) and install them on operational Army helicopters for operational service evaluation.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Applied Technology Lab.

1.0002, AAH AND BLACK HAWK CREW SEAT TESTING (DA0E3868)

D. Laananen, Simula Inc., *2223 S. 48th St., Tempe, Arizona* 85282 (DA0G0012; DAAK51-79-C-0016)

The objective of this program is to explore design techniques and criteria offering potential for improving helicopter seat crashworthiness.

The program consists of two tasks. The first task includes repairing and modifying an AAH-64 co-pilot/gunner seat, statically testing a candidate restraint system mounted on the modified seat, providing a test report, and instrumenting two restraint systems to be dynamically tested at the FAA Civil Aeromedical Institute (CAMI). The second task includes repairing a UH-60A pilot-co-pilot seat and providing it to the government for cadaver testing, providing test support that includes seat maintenance, conducting data analysis, and preparing a test report.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Applied Technology Lab.

1.0003, AEROELASTIC APPLICATIONS OF TRANSONIC UNSTEADY AERODYNAMICS

T.Y. Yang, Purdue University, Purdue Research Foundation, *Life Sciences Bldg., West Lafayette, Indiana* 47907 (DF141240; AFOSR-78-3523)

This work unit supports the technical base functions of the Structural Mechanics Division of the Air Force Flight Dynamics Laboratory. It addresses the problem areas of transonic unsteady aerodynamics, flutter, aeroelastic optimization and integration of aeroelastic disciplines. The goal is to create a numerical, analytical and experimental array of techniques to integrate the aeroelastic design, analysis and testing of aircraft structures to reduce the cost of design, acquisition and operation of new aircraft. This work unit will obtain substantial improvements in our ability to design, analyze and optimize aircraft structures for unsteady aerodynamic forces, vibrations, flutter, loads and aeroelastic control system interactions.

Initial developments will include the application of transonic unsteady aerodynamic computer programs to flutter problems. Finite element structural programs will also be modified to automate the input of data and the presentation of results.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0004, AUTOMATED LOW-COST WEATHER OBSERVATION SYSTEM (ALWOS)

R.R. Reynolds, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Weather Service, Systems Development Office, Equipment Development Laboratory, *8060 13th St., Silver Spring, Maryland* 20910 (RD590714)

OBJECTIVE: Develop a low-cost automatic weather station and sensor for the FAA. This station will essentially be a limited alternative to AV-AWOS. Only one ceiling and one visibility sensor will be used instead of three. Algorithms will be limited initially to 3000' ceiling and 1/4 through 7 miles visibility.

APPROACH: Contract for a laser ceilometer and forward scatter visibility device. Develop algorithms for these and incorporate into microprocessor. Contract for a no-moving-parts anemometer. Modify existing design for an aspirated temp/dew point sensor. Contract for a new digital-to-voice converter. Use AV-AWO type thunderstorm, precipitation and freezing rain detector. Interface sensors to microprocessor-based automatic station similar to our Sensor Processor and Display equipment. Build demonstration unit, test it and prepare specification for FAA procurement.

PROGRESS: Development of the first phase of ALWOS called WAVE (Winds, Altimeter and Voice Equipment) has been completed. Testing of the WAVE system is underway with installation planned for late December 1978.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin., Systems Research & Development Service

1.0005, BOLTED FIELD REPAIR OF COMPOSITE STRUCTURAL COMPONENTS

J. Watson, McDonnell Douglas Corp., *P.O. Box 516, St. Louis, Missouri* 63166 (DN981067; N62269-78-C-0272)

To develop and demonstrate bolted field repair techniques for composite monolithic skins with damage in the area of the substructure. To provide simplified composite repair methods for structures applicable to emerging Navy aircraft which can be performed by organizational level personnel with minimal special training and logistic support. This work is in support of work unit ZA601, Aircraft Technology, Agency Accession No. DN 681080.

Various designs will be analyzed and the most promising will be selected for fabrication and testing. Damages of up to 4-inch diameters in skins of thicknesses of up to 1/2 inch will be investigated. Included among the specific damage areas to be studied are the torque box skin adjacent to spars and ribs, and skin with associated damage to the substructure cap and skin attachment elements. Both conventional metal substructure and composite sine wave substructure will be considered. In all cases, the designs will be limited to repairs which can be performed in the field. Repair concepts will be designed so that

they can sustain a gross strain level in the repaired area of more than 4000 micro in./in. while restoring the original stiffness. In addition, the repair will enable the structure to retain a 150 DII internal pressure capability. Additional constraints such as outside access only, relaxed tolerance for field capabilities, minimal external protrusion and fuel containment will also be considered. Static tension tests and internal pressure tests will be performed on fabricated specimens to verify the selected designs and procedures.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate

1.0006, SERVICEABILITY EVALUATION OF F-14 COMPOSITE MAIN LANDING GEAR STRUT DOOR AND OVERWING FAIRINGS

J. Mahon, Grumman Corp., *S. Oyster Bay Rd., Bethpage, New York* 11714 (DN881339; N62269-77-C-0436)

To provide actual long-term-service environmental data for composite structures and to identify any potential environment-related problems which may exist. To evaluate durability, reliability and maintenance requirements of composite structures in the Navy operational environment. This work is in support of work unit ZA601, 'Aircraft Technology', Agency Accession No. DN 681080.

Under previous contracts, composite overwing fairings and main landing gear strut doors for the F-14 aircraft have been fabricated and will be installed on Navy fleet aircraft. Under this contract, the condition and maintenance requirements of these components will be closely monitored by contractor field service representatives. Instructions will be prepared for squadron and field service personnel containing non-destructive inspection schedules and methods, damage criteria and repair and maintenance procedures specifically for these components. All significant occurrences pertinent to the composite components during the service usage will be recorded. The composite fairings and doors will be left in service for a period of up to five years. Periodically a set of components will be removed for NavAirDevCen inspection and laboratory evaluation.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

1.0007, GROUND PERFORMANCE CRITERIA FOR MILITARY AIRCRAFT TIRES

P.C. Ulrich, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF140880)

This effort supports the development of tire design, performance and laboratory test criteria/techniques and the development of new and improved tires for Air Force aircraft. Presently, tires are the highest single hardware grouping logistics and maintenance cost incurred for Air Force aircraft. Reduced aircraft all-weather operation capability and aircraft ground accidents are attributable to tire traction limitations. The objectives of this effort are to develop tire design and performance criteria, tire laboratory quality control and qualification test techniques, and to laboratory test and evaluate new tire designs. Accomplishment of these objectives will result in improving Air Force aircraft ground performance and reliability, and reduce Air Force logistics costs.

Unique tire test equipment in the AFFDL landing gear test facility will be used to establish tire force and moment properties under static, rolling, and braking conditions. Tire designs will be evaluated and new tire test techniques will be developed and verified by laboratory test and evaluation under the following work efforts: A. Cast tire evaluation, B. Siped tire evaluation, C. SAE tire tests D. Radial tire evaluation, and E. Bomb damage/repaired runway simulator.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0008, MULTIVARIATE DATA ANALYSIS - SIMULTANEOUS COMPARISON TEST

P.R. Krishnaiah, University of Pittsburgh, School of Arts & Sciences, Dept. of Mathematics & Statistics, *4200 5th Ave., Pittsburgh, Pennsylvania* 15260 (DF140650; AFOSR-77-3239)

Part of AFFDL's responsibility is the development of advanced flight control systems and crew stations. The use of electro-optical, multi-function controls and displays in advanced crew stations places many new demands upon the pilot's visual and information processing channels. In addition, in order to compare candidate flight control systems and crew station components, simulations and flight tests are conducted in which pilot performance is measured. However, there is no single measure of pilot performance, thus requiring the collection of many kinds of performance data and their analysis by means of multivariate statistical techniques. The objective of this work effort is two-fold: (1) to examine visual information processing techniques employing fast Fourier transforms, and (2) to evaluate available multivariate statistical techniques for simultaneous comparison of mean vectors and the development of computer programs to implement these techniques. Objective 1 will result in optimized symbol formats for electro-optical displays in advanced crew stations. Objective 2 will provide a means of determining which of the candidate crew stations/flight control systems is best for the pilot.

OBJECTIVE 1 - automatic pattern recognition techniques will be employed to evaluate symbol confusability both within and between symbol sets. OBJECTIVE 2 - seven currently available multivariate statistical techniques will be evaluated by the contractor as to their robustness to violations of the assumptions of homogeneity of the population covariance matrix and the normality of the multivariate distribution. The most robust technique will be implemented by means of computer programs which will be available for use by AFFDL personnel.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0009, HT 79-13 APPLICATION OF THE OPERATIONAL LOADS SURVEY (OLS) DATA

D.J. Merkley, U.S. Dept. of Defense, Army, Aviation Research & Development Command, Applied Technology Lab., *Fort Eustis, Newport News, Virginia* 23604 (DA0E3863)

Investigate and document selected aerodynamic and structural flight test data associated with the helicopter during operational maneuvers, to include the following topics: the effect of compressibility on rotor pressure distributions and maps of shock locations; the effect of vortex interactions; on rotor pressure distributions and maps of vortex interactions blade stagnation point locations as a function of azimuth-blade model participation factors based on various combinations of strains, accelerations and displacements; comprehensive analysis of simultaneously recorded data for selected flight conditions to allow for correlation of simultaneous events and correlation with analysis. The resulting documentation will aid the design, evaluation and development of improved rotor systems and helicopters to meet future Army operational needs.

The required procedures to investigate each of the above topics will be defined. Each of these topics will be investigated and documented separately with the aid of the data management and analysis system data-map (data from aeromechanics' test and analytics/management and analysis package, formerly known as OLS-DMS).

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Applied Technology Lab.

1.0010, DEVELOPMENT OF AN ANALYTICAL TECHNIQUE TO PREDICT AIR CUSHIONED LANDING SYSTEM/COMPONENT PERFORMANCE

J. Kilner, Boeing Co., *7555 E. Marginal Way S., Seattle, Washington* 98124 (DF139640; F33615-77-C-3054)

This work unit supports the development and demonstration of air cushion landing systems, ACLS, for Air Force aircraft. Presently, a reliable analytical technique is not available for evaluating the performance of existing and new, proposed designs for ACLS components as a functioning part of a total flight vehicle system. The objective of this work unit is to develop and verify this needed ACLS prediction technique. Availability of the technique will significantly improve the effectiveness of, and increase the confidence level for, ACLS development and demonstration. Realization of the dramatic improve-

ments to flight vehicle mobility, self-sufficiency, and response promised by ACLS' ability to operate on any relatively level surface requires ability to evaluate ACLS performance as part of the total flight vehicle under consideration. The analytical technique developed will provide this needed capability.

An existing aircraft performance prediction computer program will be modified by the addition of system and subsystem subroutines for air cushion system, ACS takeoff and landing systems. Ability will be provided to simulate aircraft equipped with either elastic or inelastic ACS trunks. Then, the computer program shall be verified by simulating the performance of the ACS-equipped Buffalo, XC-8A, aircraft and comparing the results with actual XC-8A ACS takeoff, landing and ground operation data. Next, computer program revisions will be made as required. Finally, a technical report and computer program user's manual will be prepared and delivered along with the computer program which will be checked out and verified for use on the CDC6600 computer at Wright-Patterson AFB.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

CHEMISTRY AND MATERIALS

Includes Chemistry and Materials (general); Composite Materials; Inorganic and Physical Chemistry; Metallic Materials; Nonmetallic Materials; and Propellants and Fuels.

3.0001, IN SITU CHARACTERIZATION OF HYDROPROCESSING CATALYSTS

M. Boudart, Stanford University, School of Engineering, Dept. of Chemical Engineering, *Stanford, California* 94305 (DAR79-10071)

Few techniques are applicable to in situ characterization of catalysts, especially hydroprocessing catalysts, where both high pressure and high temperature are required. This cooperative research program between Chevron Research Company and Stanford University will utilize both X-ray absorption edge measurements and Extended X-ray Fine Structure Spectroscopy (EXAFS) to characterize Co/Mo/Al2O3 and Ni/Mo/Al2O3 catalysts at pressures (up to 2000 psig) and temperatures (up to 400 degrees C) typical of those during hydroprocessing catalysis. The reactor will employ gas and liquid hydrocarbon feeds and will simulate a trickle bed reactor. The research program will include X-ray characterization of single-component systems (e.g., Co/Al2O3) before proceeding to the actual catalysts and will study the reduction and sulfidation processes as well. X-ray absorption analysis of a number of reference materials, including Ni, Co and Mo sulfides and oxides as well as solid solutions of these materials in the alumina support will aid in interpretation of the catalyst characterization data.

SUPPORTED BY U.S. National Science Foundation, Directorate for Engineering & Applied Science, Div. of Applied Research

3.0002, LASER VULNERABILITY OF ADVANCED DESIGN SOLAR CELLS

R.L. Statler, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN980213)

The objective is to evaluate the vulnerability of advanced design solar cells to cw and pulsed high energy laser energy with the intent of defining specific damage modes and mechanisms. The results will provide guidelines for the design and manufacture of laser hardened solar cells for satellite applications.

Silicon and gallium arsenide solar cells now being developed by the AF for space missions will be subjected to cw and pulsed CO2 high energy laser radiation at 10.6 microns. Cell characteristics including forward and reverse V-I curves, spectral response, and V-I curves at amo will be measured before and after laser radiations. The changes observed in fundamental solar cell parameters will lead to an understanding of hardening procedures to be adapted in cell manufacture.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

3.0003, THEORY OF THE DIELECTRIC CONSTANT WITH APPLICATIONS TO THE MOLECULAR MOTION AND STRUCTURE OF LIQUIDS

R.L. Fulton, State University System of Florida, Florida State University, School of Arts & Sciences, Dept. of Chemistry, *205 Wildwood Dr., Tallahassee, Florida* 32306 (CHE77-23556 A01)

The frequency-dependent dielectric constant is simply related to time-dependent polarization fluctuations. These are in turn related to molecular position and orientation fluctuations, but, except for artificially simple models, the connection is not known explicitly. This project will study the second moments of the dielectric constant function, theoretically, with input from experiment, in order to assess the contribution of various kinds of molecular motions to the dielectric constant. In addition, the information so obtained will be used to assess the contribution of long-range polarization fluctuations to the surface properties of fluids.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Chemistry

3.0004, ATOMIC AND MOLECULAR PROCESSES

R.S. Berry, University of Chicago, Graduate School, Dept. of Chemistry, *5801 S. Ellis Ave., Chicago, Illinois* 60637 (CHE79-01166)

This research is in the area of quantum chemistry. Dr. Berry intends to continue a program of research involving the spectroscopic, thermodynamic and dynamic properties of nonrigid clusters, especially to relate nature and degree of nonrigidity to spectral distribution, but also extending to the interpretation of correlated motion in molecules, atoms, and nuclei, and to the interpretation of the nucleation and melting of very small clusters. The major effort in the spectroscopic aspect of this research, the analysis of spectra of nonrigid clusters, will be directed toward high-resolution spectra of real molecules. It is his intention both to predict vibration-rotation spectra from theoretical calculations based on pair interactions, to make phenomenological fits of experimental spectral lines to the patterns predicted by the correlation diagrams, and from these fits, to predict additional lines and interpret the nature and degree of molecular nonrigidity. In addition to PF5 he intends to examine the rare gas halides such as HeI2 and NeI2 that are best known from their laser-induced fluorescence spectra, and the alkali trimers and tetramers, whose potential surfaces are becoming known from theoretical calculations. This research represents a continuation of that currently supported by Foundation grant CHE7617821.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Chemistry

3.0005, SPECTROSCOPIC STUDIES AT LOW TEMPERATURES

G.E. Ewing, Indiana University, Bloomington Campus, Graduate School, Dept. of Chemistry, *2805 E. 10th, Bloomington, Indiana* 47401 (CHE79-13166)

Dr. Ewing is supported by a grant from the Structural Chemistry and Thermodynamics Program to (a) determine the structure and properties of van der Waals molecules, and (b) to study vibrational energy transfer in simple cryogenic liquids. Spectroscopic studies will be conducted on van der Waals molecules to determine bond lengths, geometry and intermolecular potentials for X2-Y type systems (e.g., N2-Kr, O2-Xe). Studies will also be carried out on more complex systems, such as CO2-Ar and (HC triple bond CH)2. These experimental studies will be complemented by theoretical studies on the role of van der Waals molecules in energy transfer processes. Such studies will contribute to a deeper understanding of intermolecular interactions which are responsible for the physical properties of solids, liquids and compressed gases. The cryogenic liquid studies will focus on CO2, N2, O2 and F2. These studies will contribute to understanding chemical reactions in the liquid state and form a basis for following vibrational energy as it moves from molecule to molecule. Such simple cryogenic systems should serve as models which can be applied to the understanding of more complex liquids.

This research is a continuation of that currently supported by Foundation Grant, CHE-7618721.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Chemistry

3.0006, METAL INSULATOR TRANSITION MATERIALS

W.J. Croft, U.S. Dept. of Defense, Army, Army Materiel Development & Readiness Command, Materials & Mechanics Research Center, *Watertown, Massachusetts* 02172 (DA0F4799)

The Army has a continuing need for very simple and rugged electronic devices of high reliability. The reduction of the number of components in a device to the absolute minimum for operation enhances the system reliability. Metal-insulator transition compounds represent the simplest solid-state devices for thermal switching of electric current - a single phase of a simple material that undergoes a large change in conductivity at the transition temperature. A typical material that undergoes this MOTT transition is vanadium dioxide which is being studied in detail.

This program will be concerned with the adaptation of the most suitable of the metal-insulator compounds to aircraft and missile applications. Consideration will be given to volume and current carrying capacity requirements for the several temperature ranges. Polycrystalline materials are being prepared by solid-state reaction in order to measure the bulk properties. Crystals are being grown by direct reduction of molten oxides and also by chemical vapor transport. Properties of these crystals are being compared with each other. Stability with temperature cycling, and effects of pressure and stoichiometry will be investigated. Efforts will be made to increase the size and perfection of the grown crystals.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Materials & Mechanics Research Center

3.0007, ELEVATED TEMPERATURE PROPERTIES OF METAL MATRIX COMPOSITES

A.P. Levitt, U.S. Dept. of Defense, Army, Army Materiel Development & Readiness Command, Materials & Mechanics Research Center, *Watertown, Massachusetts* 02172 (DA0H4704)

The technical objective is to determine the elevated temperature mechanical properties of metal matrix composites which are potential candidates for use in helicopter transmission cases such as FP/Mg, Gr/Mg, SiC/Mg, SiC/Al, and Gr/Al. Elevated temperature mechanical properties and thermal cycling data will be determined over the range of temperatures and times. Fatigue life will be evaluated as a function of fiber volume fraction.

The approach will include the fabrication and purchase of composites, preparation of test specimens, and testing them for elevated temperature, tensile strength and modules, and compressive strength and modules at temperatures up to 500 degrees F for 4 hours as a function of fiber volume fraction. Also, thermal cycling properties will be determined and fatigue properties measured. The results will contribute to the selection of the best composite for the transmission case and to the required data base for these materials.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Materials & Mechanics Research Center

3.0008, CHEMISTRY OF EPOXY CURING REACTIONS

N.S. Schneider, U.S. Dept. of Defense, Army, Army Materiel Development & Readiness Command, Materials & Mechanics Research Center, *Watertown, Massachusetts* 02172 (DA0G4763)

To characterize the curing behavior and determine the mechanism of cure of epoxy resin systems of Army interest. To improve the reproducibility and reliability of epoxy resins used in structural, fiber-reinforced composites. Major thrust is aircraft survivability.

Model epoxy resin systems will be formulated containing the principal components which have been identified in two commercial resins of Army interest, SP250 and RaC7250. The study will emphasize the use of purified components for reaction and curing mechanism studies. In certain cases, analog model reactants will be used to provide soluble products which can be separated for complete identification. Methods will include differential scanning calorimetry (DSC), torsional braid analysis (TBA), fourier transform infrared spectroscopy (FTS-IR), and high performance liquid chromatography (HPLC).

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Materials & Mechanics Research Center

3.0009, ENERGETIC EXPLOSIVE/PROPELLANT PREPOLYMERS AND BINDERS - NITROMERCURATION OF POLYDIENES AND POLYACETYLENES

J. Chien, University of Massachusetts, Amherst Campus, School of Natural Sciences & Mathematics, Dept. of Chemistry, *Amherst, Massachusetts* 01002 (DN975339; N00014-79-C-0265)

Nitro-substituted prepolymers and polymers are desirable for use in solid propellant and explosive formulations. The objective is to define the synthetic chemistry leading to nitro-substituted polyacetylenes and polydienes. Polynitroacetylene is the polymer analogue of hexanitrobenzene.

Energetic nitro-substituted polydienes and polyacetylenes will be synthesized by a new two-step nitromercuration technique. The degree of nitro substitution, glass transition temperatures, molecular weights and microstructures of the nitro-substituted polymers will be determined.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

3.0010, SCATTERING THEORY AND CALCULATIONS FOR CHEMICAL REACTIONS AND ELECTRON IMPACT PROCESSES

D.G. Truhlar, University of Minnesota, Minneapolis Campus, School of Chemistry, Dept. of Chemistry, *105 Morrill Hall, Minneapolis, Minnesota* 55455 (CHE77-27415)

Professor Truhlar and his co-workers will investigate the following research topics: (1) Quantum mechanical and semiclassical treatment of the chemical reaction of an electronically excited atom with a diatomic molecule. (2) Application of semiempirical model potentials to calculate differential cross-sections for electron impact spectroscopy. (3) Theoretical treatment of energy transfer processes involving vibrationally excited species. (4) Further development and testing of techniques for performing scattering calculations algebraically. (5) Use of approximations to simplify the theoretical treatment of rearrangement collisions, both electron-molecule collisions and chemical reactions. (6) Solution of the master equation (the equation for the time-dependence of the concentrations of species in various stages of excitation) for shock-tube dissociation of diatomic molecules using input data. This research represents a continuation of that currently supported by Foundation grant CHE75-06416.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Chemistry

3.0011, IMPROVED MEASUREMENT OF FUEL PROPERTIES

C.J. Nowack, U.S. Dept. of Defense, Navy, Naval Air Propulsion Center, Fuels Lubes & Power Dr Sys Gp, *1440 Pkwy. Ave., Trenton, New Jersey* 08628 (DN889799)

To investigate more refined methods for measuring fuel properties for both specification and research purposes.

Establish base line data from reference fuels (petroleum and non-petroleum derived hydrocarbons) and analyze them by gas chromatography (GC) and nuclear magnetic resonance (NMR). Correlate the GC and NMR data with present specification tests, and utilize these relationships to determine application of these advanced methods of fuel analysis for fuel specifications. If justified by results, establish new criteria for acceptance of JP-5 for Navy use based on compositional factors.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Material Command

3.0012, HYDROGEN ENTRY AND TRANSPORT MECHANISMS IN STRUCTURAL METALS 14057-MS
R.H. Heidersbach, University of Rhode Island, School of Engineering, Dept. of Ocean Engineering, *Administration Bldg., Kingston, Rhode Island* 02881 (DA0E9200; DAAG29 76 G0311)

To investigate hydrogen transport characteristics of structural metals, with emphasis on high hydrogen flux levels, as occur in hydrogen embrittlement cracking, and to investigate surface-entry mechanisms for hydrogen with and without the presence of molecular species which enhance hydrogen entry. Relevance - the research is complementary to a current study on the stress corrosion cracking characteristics of ESR and other high strength steels. Also, the Army has experienced failures of 7075-T6 aluminum, probably due to stress corrosion cracking. The structural alloys to be investigated are widely used by the Army in helicopters, ground mobility equipment, tanks, cannons, armored vehicles, and bridges. (1) Samples of as-cast and also electroslag-remelted (ESR) steels will be subjected to a selected set of controlled hydrogen fluxes, to examine the effect of remelt practice and subsequent impurity levels and microstructure on hydrogen transport. (2) Samples of 7xxx-series aluminum alloys will be studied as above in (1), to investigate the effect of aging on hydrogen susceptibility. (3) Utilization of infrared and Raman spectroscopy to study intermediate surface reactions which enhance hydrogen entry.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

3.0013, METAL LAMINATE DEVELOPMENT FOR STRUCTURES
R.M. Johnson, Advanced Technology Center Inc., *P.O. Box 6144, Dallas, Texas* 75222 (DN890148; N00019-78-C-0491)

Develop metal laminates used for critical structural parts, but not at the expense of strength, corrosion resistance or stress corrosion resistance.

Explore the metal/metal laminates utilizing recently developed alloys of titanium and steel.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

3.0014, RAYLEIGH-BRILLOUIN LIGHT SCATTERING OF SEGMENTAL MOTION AND STRUCTURAL RELAXATION OF POLYMER LIQUIDS AND SOLIDS
C.H. Wang, Utah Higher Education System, University of Utah, School of Letters & Science, Dept. of Chemistry, *1400 E. 2nd S., Salt Lake City, Utah* 84112 (DMR79-12457)

This research deals with light scattering as a means of probing the nature of the motions of the long molecular chains known as polymers. The motions of segments of the polymer chains and the structural relaxation when the system is subjected to hypersonic frequencies (in the GHz region) are of particular concern. Principal emphasis will be on solutions of polymers, for example the polystyrene-cyclohexane system, and detailed studies will be conducted of the entire Rayleigh-Brillouin spectra using the combined techniques of Fabry-Perot interferometry and photon correlation spectroscopy. Aqueous solutions of poly(methacrylic acid) and of poly(vinyl alcohol) will also be examined as a function of temperature, concentration, and molecular weight. These experiments will be used to test and refine a recent theory for the behavior of liquids. An additional thrust will be the examination of Brillouin scattering spectra of opaque, stretched films of poly(ethylene terephthalate) and of polyethylene with various degrees of crystallinity.

This is a renewal of NSF Grant DMR77-03707 and is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

ENGINEERING

Includes Engineering (general); Communications; Electronics and Electrical Engineering; Fluid Mechanics and Heat Transfer; Instrumentation and Photography; Lasers and Masers; Mechanical Engineering; Quality Assurance and Reliability; and Structural Mechanics. For Related Information See Also Physics.

4.0001, CONTACT STRESS ANALYSIS OF CERAMIC-TO-METAL INTERFACES
H.L. Kington, Signal Co. Inc., Airesearch Manufacturing Incorporated, *402 S. 36th St., Phoenix, Arizona* 85034 (DN875617; N00014-78-C-0547)

The objective of this research is to conduct analysis, specimen testing, and data correlation in order to provide an improved understanding of the local contact conditions that prevail at an interface between ceramic and metal components for gas turbine engines. The program will be specifically directed to study contact stresses between inserted ceramic turbine blades and a metal rotor.

A finite-element stress analysis procedure and structural evaluation technique consistent with the statistical nature of ceramic materials will be generated. Specimen testing will be conducted to obtain validation of these techniques and provide insight as to possible modifications of stress simulation or fracture prediction criteria.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0002, SOLID-STATE RADIO MAGNETIC/HORIZONTAL SITUATION INDICATOR (RMI/HSI)
B. Hoffman, Hughes Aircraft Co., Aerospace Groups, *Centinela Ave. & Teale St., Culver City, California* 90230 (DA0D3523; DAAB07-77-C-2194)

The objective of this task is the development of a digitally addressable, programmable, solid-state RMI/HSI employing a flat panel display. This unit is intended to replace existing electro-mechanical devices and be compatible with new, in-development, digital sensors, processors and the MIL-STD-1553A(B) digital data bus.

Integrate a flat panel (solid-state) display, drive circuitry, programmable symbol generator, signal processor, and control unit to accept and display all appropriate RMI/HSI signals for demonstration and evaluation of feasibility for eventual incorporation in Army aircraft.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Avionics Research & Development Activity

4.0003, ELECTRONIC PROCESSES IN INDIUM-PHOSPHATE AND RELATED COMPOUNDS
L.H. Dewaux, Hughes Aircraft Co., *3011 S. Malibu Canyon Rd., Malibu, California* 90265 (DN890136; N00019-79-C-0082)

Determination of the characteristics of bulk InP that relate to its utility as an avalanche photo diode. A primary goal of this work shall be to measure the electron and hole ionization coefficients of commercially available bulk InP and to estimate carrier lifetimes.

InP will be characterized for physical perfection and determination of carrier concentration and mobilities. Schottky barrier and P-N functions/structures will be used as analytical tools to determine ionization coefficients.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0004, NAVY VEHICLE DESIGN AND CONSTRUCTION - FUNDAMENTAL AERODYNAMIC STUDIES OF WING-BODY INTERFERENCE AT HIGH ANGLES OF ATTACK
J.N. Nielsen, Nielsen Engineering & Research Inc., *510 Clyde Ave., Mountain View, California* 94043 (DN875550; N00014-78-C-0490)

A method has been developed for calculating with reasonable accuracy the forces and moments on the components of cruciform missiles at high angles of attack (up to 50 degrees) and Mach numbers up to 3.0. As a result of this work, a problem area has emerged which limits the accuracy and usefulness of this calculation method. As either angle of attack or Mach number are increased, the effect of the body on the wing is to substantially decrease the wing lift. It is not clear what causes the large wing-body interference and theoretical calculations to quantify the adverse effects are not available. The objective of this program is to determine the causes of the adverse wing-

body interference and to establish the theory and methodology which will allow calculation of the interference effects.

A fundamental study of wing-body interference effects at high angles of attack and supersonic speeds for missile configuration will be conducted. Recent advances in viscous and inviscid numerical computation techniques will be utilized, supplemented by detailed experimental work. The flow field in which a fin or wing might operate at high angles of attack and high Mach numbers will be calculated by extending a computer program for solving the Euler equations of motion for compressible flow. Later, vortex effects will be included. The predicted aerodynamic characteristics will be compared with experimental aerodynamic data.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0005, STUDIES OF MAGNETOSPHERE-IONOSPHERE-ATMOSPHERE INTERACTIONS
R.A. Helliwell, Stanford University, School of Engineering, Dept. of Electrical Engineering, *Stanford, California* 94305 (ATM74-20084 A02)

This grant will support investigations into several aspects of magnetosphere-ionosphere-atmosphere coupling. The research includes both data analysis and theoretical work. VLF data from Stanford University's experimental programs at Siple, Antarctica, and Roberval, Quebec, will be used to study the thermal plasma dynamics and wave-particle interactions in the magnetosphere. The results will be compared with energetic particles and thermal plasma data from various ground-based instruments including incoherent scatter radars, HF sounders, photometers, etc. Atmospheric electric field data from the polar cap regions acquired through cooperative programs with other institutions will also be studied. Theoretical work will be aimed at modeling magnetosphere-ionosphere-atmosphere coupling through particle and heat fluxes and through electric fields. Specific topics to be investigated include: (1) thermal plasma distribution and flow along magnetic field lines; (2) substorm electric fields and their effects on the plasmasphere-ionosphere system; (3) correlative studies of plasmapause-associated phenomena including generation of VLF and ULF waves, particle precipitation, and ionospheric troughs; (4) artificially induced precipitation of energetic electrons; (5) theoretical studies of electrical coupling between the magnetosphere, ionosphere and lower atmosphere; (6) model studies of controlled modification of the ionosphere and plasmasphere through particle precipitation, chemical release, and F-region heating; and (7) analysis of atmospheric electric field data from polar cap regions.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

4.0006, NEW FACILITIES FOR THE ANALYSIS OF BROADBAND VERY-LOW-FREQUENCY (VLF) RADIO SIGNALS
R.A. Helliwell, Stanford University, School of Engineering, Dept. of Electrical Engineering, *Stanford, California* 94305 (DPP78-03601)

A system for spectrum analysis of broadband very low frequency (VLF) signals will be acquired. The system will be used to analyze VLF signals collected at Siple Station, Antarctica, and Roberval, Quebec, Canada. These VLF signals are used to investigate VLF wave interactions with charged particles in the earth's magnetosphere, a subject of major interest in solar-terrestrial physics.

SUPPORTED BY U.S. National Science Foundation, Div. of Polar Programs

4.0007, RESEARCH ON WALL TURBULENCE 16651-E
R.F. Blackwelder, University of Southern California, School of Engineering, Dept. of Aerospace Engineering, *3551 University Ave., Los Angeles, California* 90007 (DA0G9124; DAAG29-79-C-0137)

To experimentally determine the unsteady sequence of events associated with the turbulence bursting phenomena in the wall region of an incompressible turbulent boundary layer. Relevance - the research relates to the dynamics of turbulent flows which dominate viscous forces on high-speed vehicles such as missiles, projectiles and helicopters.

Special emphasis will be placed upon (1) exploring the effect of the probe size on the statistics measured by different sensors, (2) studying the dynamics of the streamwise vortices in the wall region, and(3) investigating the interaction between the low-speed streaks in the wall region and the high-speed sweeps associated with the outer flow.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

4.0008, ELF/VLF PROPAGATION MEASUREMENTS
R.J. Dinger, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN980135)

To measure the magnetic field strength in northern Norway of the signal radiated by the Wisconsin Test Facility (WTF) transmitter in the extremely low frequency (ELF) band.

A receiver capable of demodulating the signal broadcast by the WTF will be installed near Tromso, Norway. Measurements of the magnetic field strength will be made in August 1979, in coordination with rocket sounding tests to be conducted at Thule, Greenland, by the Air Force.

SUPPORTED BY U.S. Dept. of Defense, Defense Nuclear Agency

4.0009, MOTION DRIVE SIGNALS FOR FLIGHT SIMULATORS
W.T. Harris, U.S. Dept. of Defense, Navy, Naval Training Equipment Center, Advanced Simulations Concepts Lab., *Orlando, Florida* 32813 (DN794017)

Develop several methods for calculating motion drive signals in flight simulators and relate them to motion system characteristics, flight maneuvers and training effectiveness.

Select several methods from those found in use or in the literature. Perform a preliminary selection of algorithms to be evaluated for training effectiveness by two selection experiments; the first based on system performance measures (an in-simulator study), the second, a comparison of pilot control activity (in simulator to aircraft). Then evaluate the pre-selected algorithms using transfer of training methods.

SUPPORTED BY U.S. Dept. of Defense, Naval Training Equipment Center, Advanced Simulations Concepts Lab.

4.0010, HEAD AND EYE TRACKING SYSTEM STUDY
J.J. Kulik, U.S. Dept. of Defense, Navy, Naval Training Equipment Center, Advanced Simulations Concepts Lab., *Orlando, Florida* 32813 (DN994012)

In a pilot helmet-mounted display system, head/eye tracking subsystems are essential when the display is an area of interest type. Research is needed to determine the maximum allowable delay in presentation of visual scenes after head and eye movements. Work on eye motions to determine eye speeds and type of motion is needed to enable construction of predictors for use as compensation for overall system time constant to keep within acceptable limits.

A television system will be used to produce a spot which will follow the head and eyes as they move to various positions. Variable delays ranging from 4 to 154 milliseconds will be introduced between head/eye motion and the motion of the spot on the TV sceen. The maximum allowable delay will be determined using standard human factors testing techniques. An electronic system will be built and used to determine angular eye velocities. A determination will be made as to whether or not final eye fixation points can be predicted from velocity curves (e.g. From maximum eye velocity vs. final eye position). If feasible, compensation will introduced into the testing to see if

total system time constant can be reduced to within acceptable limits.

SUPPORTED BY U.S. Dept. of Defense, Naval Training Equipment Center, Advanced Simulations Concepts Lab.

4.0011, MECHANICS OF SURFACE DAMAGE IN ELASTOHYDRODYNAMIC CONTACTS 16005-E

H.S. Cheng, Northwestern University, Evanston Campus, Technological Inst., Dept. of Mechanical Engineering & Astronautical Science, *633 Clark St., Evanston, Illinois* 60201 (DA0G8912; DAAG29-78-G-0199)

To gain a basic understanding of pitting and scuffing failures in heavily loaded lubricated contacts in gears, cams, and rolling element bearings. Relevance - the subject has a high priority in the design of military vehicles and aircraft, particularly in helicopter gear box design.

Analytic and numerical determinations of subsurface stress distributions at asperities will be carried out for normal and tangential surface loads as well as for thermal conditions. Two- and three-dimensional solutions will be formed and related to pitting and scuffing.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

4.0012, THE TRAILING EDGE PRESSURE GRADIENT AS AN AIRFOIL DESIGN PARAMETER

A.I. Ormsbee, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Aero. & Astro. Engineering/ Theo. & Appl. Mechanics, *207 Engineering Hall, Urbana, Illinois* 61801

A study is being conducted of the use of the trailing edge pressure gradient as an input parameter in the design of low-speed airfoils. Preliminary results indicate the possibility of extending the pressure recovery region into the airfoil wake, permitting an increase in CLmax.

SUPPORTED BY University of Illinois

4.0013, PLASMA DYNAMICS

A. Bers, Massachusetts Inst. of Technology, School of Engineering, Dept. of Electrical Engineering & Computer Science, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (ENG79-07047)

A range of analytical, computational, and experimental problems associated with plasma phenomena is being explored. Activities center on the following topics: 1. Nonlinear wave interactions - stochastic particle dynamics in waves of finite amplitude, renormalized wave-wave interaction theory, and space-time evolutionary dynamics of nonlinear interactions are being explored. 2. Nonlinear fluctuation turbulence and transport theory - the creation and decay of non wave-like fluctuations (clumps, holes, etc.) are being studied. 3. Experiments with relativistic electron beams - laser-initiated reflexing in a diode, stimulated backscattering, and Stark broadening induced by intense electric fields are topics being investigated. 4. Experiments in nonlinear wave-particle interactions - this work focuses on measurements of phase space granulation in a counter-streaming electron beam system.

This is a continuation of research previously supported under NSF grant ENG-7700340 A01.

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

4.0014, STATISTICAL IMAGE PROCESSING FOR REAL-TIME OPERATIONS

C.H. Chen, Southeastern Massachusetts University, School of Engineering, Dept. of Electrical Engineering, *North Dartmouth, Massachusetts* 02747 (DN975533; N00014-79-C-0494)

The objective of this effort is to improve the Navy's surveillance capability to detect, identify and track targets by creating and developing improved statistical and probabilistic methodology applicable to satellite technology.

Statistical and probabilistic research will be conducted in several areas, including (1) comparative evaluation of decision rules, (2) statistical feature extraction for image recognition and segmentation, (3) statistical contextual analysis of images, and (4) statistical modeling of images.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0015, THE ABSORPTION OF CO2 LASER RADIATION IN DENSE PLASMAS

D.R. Bach, University of Michigan, Ann Arbor Campus, School of Engineering, Dept. of Nuclear Engineering, *Ann Arbor, Michigan* 48104 (ENG79-04820)

This research program is a study of non-linear interaction phenomena which arise when the radiation from a high intensity carbon dioxide laser beam interacts with a dense plasma. The interaction phenomena studied are closely related to the mechanisms important in the coupling of laser light with pellets of various kinds used in laser fusion experiments. Particular interest centers on experiments that involve laser penetration of a Z-pinch plasma whose density is greater than critical in order to understand both the interaction responsible for the penetration and the nature of plasma heating in the penetration region. Spatial and time dependencies of the plasma density are measured using a holographic interferometer. Thomson scattering measurements are also made in order to measure the temperature change in the plasma caused by the laser irradiation and to determine whether the penetration and heating is caused by turbulence. Separation of non-linear interactions from motion occurring on a hydrodynamic time scale is achieved with the aid of a short pulse laser system.

This is a continuation of research previously supported under NSF grant ENG-7620279.

SUPPORTED BY U.S. National Science Foundation, Directorate for Engineering & Applied Science

4.0016, ENGINEERING SPECIALIZED RESEARCH EQUIPMENT - COMBUSTION RELATED PARTICULATE AND DROPLET SIZING INSTRUMENTATION

J.A. Nicholls, University of Michigan, Ann Arbor Campus, School of Engineering, Dept. of Aerospace Engineering, *Ann Arbor, Michigan* 48104 (ENG79-11376)

An image analyzer is to be purchased. This instrument would be used by faculty members in the Department of Aerospace Engineering for a number of research projects relating to combustion particulate and droplet sizing measurements.

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

4.0017, COMMAND AND CONTROL - COLOR DISPLAY DESIGN GUIDE

M.M. Krebs, Honeywell Inc., Systems & Research Center, *2600 Ridgeway Pkwy. N.E., Minneapolis, Minnesota* 55413 (DN675169; N00014-78-M-0072)

The objective of the research is to develop a design guide, a set of principles for the design of aircraft displays which would incorporate the use of color. The integration of cockpit displays has created displays cluttered with information which increases pilot/operator workload. Color offers an additional dimension to information coding which appears to offer improved display information transfer. Color engineering technology is available for displays. However, the optimum application of color to the information to be displayed has not been established.

The technical approach will be based on a laboratory research program which will supplement available color research data. Additional inputs to the research data will be provided through working group sessions involving contractor and government representatives. The contractor will assimilate the research data, formulate a design guide, and make color coding recommendations for specific displays.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0018, DETERMINATION OF DIRECTIONAL WAVE SPECTRA FROM SAR

G.E. Carlson, University of Missouri, Rolla Campus, School of Engineering, Dept. of Electrical Engineering, *Rolla, Missouri* 65401 (DN975291; N00014-79-C-0343)

The objective of this research is to determine the feasibility of determining ocean wave directional spectra from less than full SAR images. Real-time global determination of directional wave spectra from SAR data is a critical need for all naval planning and operational missions.

SEASAT SAR data will be used to test the feasibility of this concept. Discrete Fourier transforms of portions of digitized range scans will be obtained from the same wave train which will produce a smoothed one-dimensional spectrum. Pairs of range scans will then be correlated to identify wave train offset from scan to scan giving wave train direction. Combined they will produce wave direction and frequency.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0019, STUDIES OF IONOSPHERIC IRREGULARITIES AND PLASMA INSTABILITIES IN THE MAGNETOSPHERE

R.N. Sudan, Cornell University, Ithaca Campus, Lab. of Plasma Studies, *159 Sapsucker Woods Rd., Ithaca, New York* 14850 (DN975322; N00014-79-C-0308)

The Navy needs quantitative information on the active state of the ionosphere and magnetosphere for radio communication applications and uses. In particular, density irregularities resulting from turbulence in the ionosphere and in the aurora will be studied. The dynamics of triggered Whistler emissions will also be studied.

Irregularities in the ionosphere and the aurora resulting from nonlinear interactions will be modeled in terms of a two-dimensional strong turbulence theory whose basis is the 'direct interaction approximation'. Analytical and numerical work on triggered Whistler emissions will be pursued in collaboration with Professor J. Denavit.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0020, TIES MODULAR PACKAGING STUDY

E. Grove, General Electric Co., A/C Equipment Division, *French Rd., Utica, New York* 13502 (DN981044; N62269-79-C-0007)

To establish a comprehensive modular packaging approach suitable for multisystem/multiplatform application of the TIES architecture. This contract supports work unit ZC910, Agency Accession No. DN681082.

Review present packaging techniques, develop new concepts, evaluate feasibility, and recommend and define a packaging scheme to facilitate the TIES architectural concept of programmable modules to configure future naval aircraft to differing mission requirements. Emphasis will be on the geometrically distributed nature of the TIES architecture, particularly the frequency conversion subsystem.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Communication Navigation Tech Directorate

4.0021, ACOUSTIC EMISSION MONITORING OF FATIGUE CRACKING IN FULL-SCALE AIRCRAFT

Unknown, Grumman Aerospace Corp., *S. Oyster Bay Rd., Bethpage, New York* 11714 (DN890168; N00019-79-C-0218)

Investigate the feasibility of acoustic emission monitoring for real-time detection and location of fatigue crack initiation and growth in full-scale aircraft structure.

Acoustic emission monitoring systems, combining noise discrimination and frequency analysis concepts, will be used to detect and locate fatigue cracking in a high extraneous noise environment of a full-scale aircraft fatigue test.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0022, AIR CYCLE COMPRESSOR-EXPANDER

R. Smolinski, Ecton Corp., *5683 Webster St., Dayton, Ohio* 45414 (DA0P3645; DAAK70 79 C 0042)

Develop an air cycle (reversed Brayton cycle) compressor-expander with a coefficient-of-performance (COP) of one (1).

Conduct an exploratory development program using the rotary vane, positive displacement air cycle compressor-expander concept with special attention to reducing internal heat transfer from the compressor to the expander, reducing blade flexing and friction at rotor plates and end plates and increasing volumetric efficiency.

SUPPORTED BY U.S. Dept. of Defense, Army, Mobility Equipment Research & Development Command

4.0023, RADAR GROUND CLUTTER ANALYSIS AND SIMULATION

J. Haynes, U.S. Dept. of Defense, Air Force, Avionics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF098980)

To obtain statistical information concerning ground clutter return from varied terrain types and depression angles, to update the latest IITRI clutter model and incorporate this information into a radar simulation program. This will culminate in the development of an IH capability of simulating existing and proposed radar systems on our computer and testing the response of these systems to different types of accurately simulated ground clutter so that the optimum system parameters can be chosen.

To take the computer tapes containing the ground clutter return and statistically analyze them on the ASD computer system. Use this information to update the clutter model and develop a data file of clutter maps for evaluating system performance using a radar simulation program developed by IITRI for determining probability of detection in a dynamic clutter background. This study will include the generation of histograms of radar crosssection per unit area vs. number of samples, for the various terrain types and depression angles as well as the mean and standard deviation. These statistics will be done for the various clutter models, e.g., Rayleigh and log-normal to determine their validity.

SUPPORTED BY U.S. Dept. of Defense, Air Force

4.0024, ENERGY CONVERSION - EROSION STUDY IN TURBOMACHINERY

W. Tabakoff, University of Cincinnati, School of Engineering, Dept. of Aerospace Engineering, *101 Baldwin Hall, Cincinnati, Ohio* 45221 (DN875756; N00014-78-C-0590)

The objective of this project is to investigate the basic phenomena of erosion in association with solid particles and gas flows with possible application to turbomachinery parts which are exposed to particulate environments. The effort is experimental and theoretical in nature and will contribute to an increased understanding of the effects on performance of erosion phenomena as well as on engine life relative to naval and marine power plants and fixed installations.

Study will be made of the effects of particle size on erosion, effects of true impact angles of particles, and aerodynamic effects of temperature on erosion of alloys and development of a fluid mechanics approach to alleviate erosion. The final goal will be to develop a quantitative model to predict erosion in future advanced turbomachinery operating in particulate environments.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0025, WEAPONRY - TURBULENT BOUNDARY LAYER SEPARATION IN ADVERSE PRESSURE GRADIENTS

R.L. Simpson, Southern Methodist University, School of Engineering & Applied Sciences, Dept. of Civil & Mechanical Engineering, *Hillcrest & University, Dallas, Texas* 75222 (DN975360; N00014-79-C-0277)

The objective of this study is to improve current knowledge of the structure of turbulence for separated and separating boundary layers in adverse pressure gradients. Such information

is needed for better design of diffusers and blade passage in aircraft turbojet engines, and ultimately should lead to improved propulsion systems for naval weaponry applications.

Experiments will be run on a flat plate in a wind tunnel test section with a two-dimensional mean flow. The turbulent boundary layer is established on the plate with the aid of a leading edge trip, and an adverse pressure gradient typical of an airfoil in a cascade is produced by contouring the upper wall of the test section. Measurements will be made in three dimensions, both upstream and downstream of separation, using hot wire anemometry in regions without backflow, and directionally sensitive laser velocimetry in other regions. The data will be analyzed and correlated, and the implications of the results on modeling of separated turbulent flows will be considered.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0026, COMPOSITE ANALYSIS

G.F. Carey, University of Texas, Austin Campus, School of Engineering, Dept. of Aerospace Engineering & Engineering Mechanics, *200 W. 21st, Austin, Texas* 78712

A Monte Carlo method is utilized to simulate a class of 'non-uniform' composites and a statistical technique applied in conjunction with finite element analysis of variational boundary value problems which are posed on the sample sub-domains. The procedure has been developed as an approach for determining estimates of the macroscopic material properties of fabricated composites. Some aspects of this continuing research have been presented at a meeting of the Engineering Mechanics Division of the ASCE in May and at the recent (November 1977) meeting of the Society of Engineering Science at Lehigh. The underlying theory is the subject of a proposal submitted to the Engineering Mechanics Section of NSF and will be undertaken collaboratively with Julian Pop of the Department of Aerospace Engineering and Engineering Mechanics .

SUPPORTED BY University of Texas

4.0027, ENGINEERING ANALYSIS OF ATTITUDE BEHAVIOR OF SPACE PROBES AND RIGID BODIES IN GENERAL

V. Szebehely, University of Texas, Austin Campus, School of Engineering, Dept. of Aerospace Engineering, *200 W. 21st, Austin, Texas* 78712

DESCRIPTION: Numerical and analytical methods are used to investigate the behavior of space probes as influenced by various perturbing effects, such as laser beams, nearby explosions, other gravitational effects, effects of rocket plumes, etc. The implication to the Texas economy is that several satellites which are photographing the Texas background regarding the growth of vegetation require high degree altitude stability in order to obtain precise photographic information. To maintain the proper orientation of these vehicles is a major engineering problem and this project tries to alleviate and solve the very same problem.

SUPPORTED BY University of Texas

4.0028, NAVY ENVIRONMENT - BALLOON COMMAND-CONTROL

P.R. William, Utah Higher Education System, Utah State University, Center for Research in Aeronomy, *Main Bldg., Office 104, Logan, Utah* 84321 (DN775171; N00014-77-C-0108)

This research effort has as its goal the development of a lightweight, inexpensive, expendable scientific balloon command-control-tracking system that can be used by Navy researchers who wish to fly small expendable experiments to high altitudes without the requirement for payload recovery. This system will allow much flexibility combined with strict compliance with flight safety requirements imposed by the Federal Aviation Administration.

The contractor has developed a lightweight, expendable command receiver for balloon control. He has added a transmitter and power supply to the system, making the control unit independent of the primary scientific equipment. This combination makes possible fixing the balloon's position in slant range and azimuth. The contractor will now add an altitude read-out for precise location. The system will be field-tested.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0029, MECHANISMS OF RARE-GAS HALIDE LASERS

W. Koechner, Science Applications Inc., *1911 N. Fort Myer Dr., Suite 1200, Arlington, Virginia* 22209 (DN880097; N00173-78-C-0414)

To investigate the mechanisms occurring in rare gas laser plasmas and to determine the feasibility of generating efficient lasers in this media.

The contractor will develop a kinetics package which describes the atomic, ionic and neutral species reactions in electron-beam sustained rare-gas halide lasers. Diagnostic requirements designed to test the accuracy of the kinetics package will be carried out.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

4.0030, AN ANALYSIS OF THE THERMAL CONDUCTANCE OF DISSIMILAR METAL CONTACTS

L.S. Fletcher, University of Virginia, School of Engineering & Applied Science, Dept. of Mechanical & Aerospace Engineering, *Garrett Hall, Charlottesville, Virginia* 22903 (ENG78-24684)

The objective of this research is to investigate experimentally and theoretically the conduction heat transfer characteristics of metallic junctions composed of dissimilar metal junctions. Additionally, the dependence of the thermal contact conductance magnitude upon the direction of heat flow through the metallic contact (a phenomenon known as thermal rectification or directional bias) is evaluated. Supplementary goals for the research program include the generation of a substantial base of experimental contact conductance data, the development of a correlation to predict conductance values suitable for engineering applications, and the experimental determination of the effects of various parameters upon the thermal contact conductance and the thermal rectification at dissimilar metal interfaces.

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

GEOSCIENCES

Includes Geosciences (general); Earth Resources; Energy Production and Conversion; Environment Pollution; Geophysics; Meteorology and Climatology; and Oceanography. For Related Information See Also Space Sciences.

5.0001, STUDIES OF NATURALLY-OCCURRING ELF AND VLF RADIOWAVES AND ASSOCIATED ULF AND PARTICLE PRECIPITATION PULSATIONS

R.R. Heacock, University of Alaska, Fairbanks Campus, Geophysical Inst., *Fairbanks, Alaska* 99701 (ATM7819963)

There are still many aspects of particle precipitation into the auroral ionosphere that are not well understood. A principal goal of this project is to gain additional insight into these processes by focusing attention on precipitation pulsations that are associated with special events such as storm sudden commencement impulses, substorm break-up impulses, events of quasi-sinusoidal character, events for which the ELF/VLF noise amplitudes are modulated at ULF frequencies less than 1 Hz, in correlation with ULF magnetic field pulsations.

This project is one of many International Magnetosphere Study (IMS) related programs. Much of the effort also involves cooperation with investigators who are taking data on IMS satellites.

This grant continues study of the relationships between naturally occurring radio waves and auroral particle precipitation. More specifically the Carib-Peak ELF-VLF and riometer site will be maintained and operated, as will the associated data recording facility at Poker Flat Research Range. College and Fort Yukon riometer data will continue to be recorded on magnetic tape. Macquarie Island ELF data will be analyzed together with Carib ELF data for conjugate characteristics. Carib ELF data will continue to be supplied to IMS satellite experimenters as re-

quired for satellite-ground comparisons. Riometer pulsation data will be analyzed together with magnetic field pulsations, ELF data, and DMSP satellite electron precipitation data in efforts to understand the roles of pulsations and ELF in producing auroral particle precipitation.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

5.0002, CONTINUATION OF THE OPERATION OF MERIDIAN SCANNING PHOTOMETERS IN ALASKA DURING THE INTERNATIONAL MAGNETOSPHERIC STUDY

G.J. Romick, University of Alaska, Fairbanks Campus, Geophysical Inst., *Fairbanks, Alaska* 99701 (ATM78-25249)

Meridian scanning photometers provide a ground-based technique for determining the particle precipitation characteristics associated with various magnetospheric regions. Thus, it is important during the International Magnetospheric Study (IMS) to operate systematically a number of these systems dispersed along a geomagnetic meridian to provide a space-time mapping of the magnetospheric activity. In addition, these observations provide a temporal link between periodic satellite or rocket observations.

This grant continues operation of the meridian scanning photometers at Poker Flat Research Rocket Range on a routine schedule and at Ft. Yukon, Alaska, on a reduced selected-day schedule, along the 57 degree east geomagnetic meridian, through the IMS until March 31, 1980.

The 4278A N2 ion, 6300A and 5577A OI and 4861A H emissions are monitored in a two-second horizon-to-horizon scan period with a filter tilting mode of operation also available when the ration of auroral to background intensity is low. Digital electronics and computer-formatted magnetic tape recordings are employed. In addition, stellar observations will be performed to determine the degree of cloudiness and an absolute intensity calibration will be made on each data tape.

Lists of available data will be sent to the World Data Center for distribution to interested scientists. Detailed photometric data will be available through direct contact between investigators.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

5.0003, IMAGE PROCESSING

R.M. Batson, U.S. Dept. of the Interior, Geological Survey, Geologic Div., Branch of Astrogeologic Studies, *2255 N. Gemini Dr., Flagstaff, Arizona* 86001 (9580-00991)

The Image Processing Facility will continue to provide custom processing of LANDSAT and planetary spacecraft pictures, and digital arrays of spatial geologic, geophysical, and geochemical data to support investigations of the Geologic Division.

Research will continue in the development of new techniques for the manipulation of spatial data. Specifically the following investigations are under way: 1. Derivation of topographic data by processes involving computation of ratios between bands of multispectral images. 2. Continued development of methods of correlating and displaying geophysical, geochemical, topographic and other non-image data. 3. Development of new multispectral clustering methods for image classification. 4. Development of digitally encoded catalogs of geologic features on the planets. 5. Development of techniques of using line digitizing equipment for editing and revising raster formatted data. 6. Continued development of techniques for making maps and mosaics, both in black and white and in color, of digital television images from spacecraft.

SUPPORTED BY U.S. Dept. of the Interior, Geological
Survey, Geologic Div.

5.0004, PG-POLAR ICE INVENTORY

H. Masursky, U.S. Dept. of the Interior, Geological Survey, Geologic Div., *2255 N. Gemini Dr., Flagstaff, Arizona* 86001 (9580-02361)

The history, mobility, and storage of water and other atmospheric volatiles on Mars has become a major area of scientific controversy, particularly since the start of the Viking missions. The history of the atmosphere, the total planetary volatile inventory, the age and formation of ubiquitous large and small channels, a host of glacial phenomena observed in Orbiter images all revolve on the basic issues of how much and when water evolved from the interior as well as where it is now stored.

Various hypotheses have been proposed concerning the fate of Martian volatiles. The only sinks which can be examined directly are those at the poles where we now have excellent stereo coverage. Stereo data on slopes and thicknesses will be combined with other geologic data to estimate the volatile inventory. These estimates will strongly influence future hypotheses. In addition, by counting and studying the morphology of craters on the ice, layered deposits, and adjacent polar terrain, it may be possible to evaluate the rate of formation and destruction of these materials. The hypotheses concerning climatic history and the possible presence of life on Mars are strongly dependent on the availability of water at present and in the past.

SUPPORTED BY U.S. Dept. of the Interior, Geological
Survey, Geologic Div.

5.0005, EOLIAN FEATURES OF THE MARTIAN POLAR REGION

J.F. McCauley, U.S. Dept. of the Interior, Geological Survey, Geologic Div., *2255 N. Gemini Dr., Flagstaff, Arizona* 86001 (9580-02381)

Viking Orbiter pictures indicate complex relationships among the various ice facies of the north polar cap, the large-scale, maturely developed dunes of the circumpolar sand seas, the layered terrain, and numerous wind erosion patterns superposed on these depositional features. We plan a detailed regional photogeologic analysis of these relationships, using our data bank of some 15,000 ground, aerial and satellite pictures of terrestrial eolian features for interpretive background. A main objective is to map the distribution and trends of the wind-formed terrains in the polar region of Mars in order to show their inferred evolution with time and relations to source materials and surface transportation regimes. Systematic measurements will be made of the major eolian landform types for statistical comparison with terrestrial features. Results of the photogeologic analysis will be applied to interpretations of the surface geologic processes and climatic history of Mars.

SUPPORTED BY U.S. Dept. of the Interior, Geological
Survey, Geologic Div.

5.0006, GROUND-WATER HYDROLOGY OF THE COCONINO AQUIFER IN SOUTHERN APACHE CO., ARIZONA--A MATHEMATICAL ANALYSIS

P.P. Rex, U.S. Dept. of the Interior, Geological Survey, Water Resources Div., *Flagstaff, Arizona* (AZ 78-046)

Coconino aquifer will be source of water for large groundwater withdrawals in near future. Coronado generating plant and possible construction of a second generating plant will require additional water. Also, more water will be needed to support construction and maintenance personnel and satellite industries. Pumpage may increase by 50,000 AF within the next few years. Effects of project pumpage are unknown because the ground water flow system is poorly defined in part of the area.

The principal objectives are: 1. to provide a preliminary estimate of the average recharge and discharge values and to define the aquifer characteristics of that part of the Coconino aquifer that is within southern Apache County, and 2. to determine the potential effects of the projected ground-water withdrawals.

Potentiometric surface, aquifer thickness, water-level decline and aquifer characteristic data at selected points are available. Additional data required include estimates of recharge and discharge. Recharge will be estimated by a flow net analysis and discharge will be estimated on the basis of available springflow,

streamflow and pumpage measurements. The model will be calibrated using steady-state and transient-state techniques. When the model is calibrated the project pumpage values will be used to simulate water-level declines for the years of 1985 and 2000.

Aquifer characteristics were analyzed, recharge was estimated by flow-net analysis, a two-dimensional digital model was constructed, and the steady-state calibration is almost complete. The most significant finding thus far is the realization of the relation between ground-water flow and subsurface structure and related secondary permeability.

Final steady-state calibration and transient-state verification. Write report.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Water Resources Div.

5.0007, SEISMIC HAZARD STUDY OF THE WESTERN PORTION OF THE GARLOCK FAULT, SOUTHERN CALIFORNIA

J.D. Scott, Fugro Inc., *3777 Long Beach Blvd., Long Beach, California* 90807

STATE TO WHICH PROJECT PERTAINS: California.

The purpose of the investigation is to determine the history of movement of the western Garlock Fault. To accomplish this the investigation will concentrate primarily in the vicinity of Castaic Lake, Twin Lakes, and Oak Creek Canyon where conditions are thought to be favorable.

The objectives of the investigation during the first year will be: 1) Analysis of aerial photographs to locate the best defined fault breaks, 2) Field reconnaissance to examine and verify surface ruptures and fault related features determined from aerial photograph analysis and existing literature, 3) Subsurface sampling by hand auger will be conducted to determine whether dateable deposits are present at the preliminary trench sites, 4) Trenches will be dug at selected localities to evaluate fault displacement relationships, 5) Level lines will be surveyed in the vicinity of trenches to provide elevation data, 6) Selected deposits will be dated by various methods to determine recurrence rates of fault movement.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0008, SATELLITE EQUATORIAL SCINTILLATION STUDY

M.R. Paulson, U.S. Dept. of Defense, Navy, Naval Ocean Systems Center, Environmental Sciences Dept., *San Diego, California* 92152 (DN988526)

Acquire a data base which can be used to develop a statistical model of equatorial scintillation of satellite signals. Such a model could be used to predict the probability of the occurrence of significant equatorial scintillation at any given time and the extent to which satellite communications are adversely affected.

Record the signal amplitudes at Guam from the two gapfiller/MARISAT satellites at 257 and 1541 MHz for six months or more. This will provide data on scintillation activity and intensity at two frequencies and two elevation angles, 11 degrees and 51 degrees. Calculate amplitude distributions & cumulative amplitude distributions, mean and standard deviations, & fade duration distributions for several fade depths. These calculations would be made as a function of time for each of the satellites and each frequency.

SUPPORTED BY U.S. Dept. of Defense, Office of Naval Research, Earth Sciences Div.

5.0009, PENINSULAR RANGES TECTONICS

V.R. Todd, U.S. Dept. of the Interior, Geological Survey, La Jolla Marine Geology Lab, *8604 La Jolla Shores Dr., San Diego, California* 92037 (9540-01625)

STATE TO WHICH PROJECT PERTAINS: California.

Review and synthesize existing historic, seismic, geologic, and geodetic records of all faults with known or suspected Late Quaternary activity. Study satellite and high-altitude (1:90,000 to 1:230,000 scale) photography and other imagery for linear and other structural features that appear to reflect Late Quaternary tectonic activity. Study known or suspected young faults by intermediate-scale air photos (including low-sun-angle photos) and by detailed geologic mapping. Determine for each active fault the length, width of hazardous zone, distribution and nature of adjacent landslides, character, rate and chronology of past displacements from historic slip events, and Late Quaternary stratigraphic and geomorphic record. Compile bedrock geologic maps at scales of 1:24,000 and 1:62,500. Landslides will be mapped by photo-interpretation, and consolidated deposits will be classified and mapped.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0010, FLUVIAL HISTORY OF MARS

M.H. Carr, U.S. Dept. of the Interior, Geological Survey, Geologic Div., *345 Middlefield Rd., Menlo Park, California* 94025 (9580-02367)

Determine the distribution and age of run-off channels, outflow channels, and fretted channels.

Reconstruct the history of fluvial action on Mars and determine how it correlates with other events in the planet's history.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0011, MULTIVARIATE ANALYSIS OF GEOLOGIC VARIABLES APPLIED TO MINERAL RESOURCE ESTIMATION

W.D. Menzie, U.S. Dept. of the Interior, Geological Survey, Geologic Div., *345 Middlefield Rd., Menlo Park, California* 94025 (9340-02125)

STATES TO WHICH PROJECT PERTAINS: Alaska, California, Nevada.

Prepare reports on the mineral resources of Big Delta Quadrangle, Alaska and Phillip Smith Quadrangle, Alaska. Construction of grade and tonnage, or contained metal, models for use in Walker Lake Quadrangle mineral resource assessment. Investigate spatial distribution of mercury deposits in the coast ranges of California. Test and modify a method of correcting for size-biased sampling of chromite deposits and report on the results.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0012, QUANTITATIVE MORPHOLOGY OF VOLCANOES

R.J. Pike, U.S. Dept. of the Interior, Geological Survey, Geologic Div., *345 Middlefield Rd., Menlo Park, California* 94025 (9580-02355)

Quantitative comparisons of Martian volcanoes with terrestrial edifices whose mode of origin is known are the immediate goals of the proposed research. Various aspects of Martian crustal properties, magmatic and volcanic processes, and geologic history ultimately will be interpreted from the resulting correlations or the absence of them. Other products will include a refined classification of central volcanoes on the terrestrial planets and improvements upon current sets of data that characterize different classes of volcanoes. The research is an integrated, long-term program of work on planetary volcanic landforms, with current emphasis on Mars, wherein a systematic, quantitative approach is applied to the interpretation of process from landform morphology. In FY 79, the topographic dimensions (especially height and breadth of the edifice and diameter, depth and circularity of the summit depression) of 15 large Martian volcanoes will be measured or remeasured from data that have been reduced photogrammetrically from Viking Orbiter images. Other, smaller edifices will be measured if the data can be generated. While these data are being prepared for Martian volcanoes, information on three of the most likely classes of candidate analogs on Earth - non-tholeiitic lava shields, tablemountains, and maars - will be reviewed, updated, and improved.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0013, FINE PARTICULATE MONITORING IN THE WESTERN ENERGY RESOURCE DEVELOPMENT AREA
T. Cahill, University of California, Davis Campus, School of Letters & Science, Dept. of Physics, *Davis, California* 95616 (R806459-01; J833C-083)

OBJECTIVE: Establish a baseline of air ambient fine particulate data in the Western Energy Resource Development Area.

APPROACH: A forty-station fine particulate sampling network will be deployed over the states of Arizona, New Mexico, Colorado, Utah, Wyoming, North Dakota, Montana, and South Dakota. The mass and elemental composition of aerosols in two size ranges (less than 2.5 micron, less than 15 micron) will be determined on the twice-weekly samples at each station. Correlations will be developed with meteorological data and other air quality measurements (e.g., visibility).

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Environmental Monitoring & Systems Lab.

5.0014, A QUANTITATIVE STUDY OF THE TEMPORAL VARIATIONS IN THE MAGNETOTAIL CONFIGURATION
R.E. Holzer, University of California, Los Angeles Campus, Inst. of Geophysics & Planetary Physics, *405 Hilgard Ave., Los Angeles, California* 90024 (ATM79-16245)

This grant will help to develop a quantitative empirical model of the temporal changes of the magnetic flux pattern in the magnetotail utilizing IMS satellite and ground-based data. Previous work has yielded quantitative relations between the southward flux of the Interplanetary Magnetic Field (IMF), the auroral AL index, and flux transfers between the forward magnetosphere and the magnetotail. The observations of continuous changes of magnetic field (B) in the tail during significant flux transfer processes will be obtained for as many positions in the tail as possible. The previously developed quantitative relations, with appropriate time delays, will be employed in correlating the several series of observations of B. It is expected that a model of the continuous change in structure of the tail and hence its energy state will be evolved. Such an empirical model will be used in testing a number of theoretical predictions concerning magnetic tail transformations.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

5.0015, HIGH-RESOLUTION SENSING TECHNIQUES FOR SLOPE STABILITY STUDIES
R.B. Johnson, Colorado State University, School of Forestry & Natural Resources, Dept. of Earth Resources, *Fort Collins, Colorado* 80523 (9550-01954)

The U.S. Geological Survey and the National Bureau of Standards will jointly complete the study of high-resolution sensing techniques (other than remote sensing) for application to investigation of slope stability. This will include summarizing the state-of-the-art in the factors that contribute to slope instability, determination of those factors that are measurable by remote means and estimation of their vaules, determination of appropriate geophysical measurement techniques to be employed, completion of report summarizing all aspects of study, conclusions, and recommendations for use and further research.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0016, ELECTRONIC LAB SUPPORT
C.M. Mitchell, U.S. Dept. of the Interior, Geological Survey, Geologic Division, *Box 25046, Denver Federal Center, Denver, Colorado* 80225 (9780-01758)

STATE TO WHICH PROJECT PERTAINS: Colorado.

The objectives are to provide laboratory and field support for equipment which is used in the development and application of new techniques for assessment and evaluation of mineral resources. During this year the truck magnetometer system will be installed in a new vehicle, new instrumentation will be developed for the scale model facility, a new airborne digital acquisition system will be tested and installed in the Porter aircraft and maintenance and field support will be supplied for other equipment.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0017, ISOTOPES OF THE UPPER MANTLE
M. Tatsumoto, U.S. Dept. of the Interior, Geological Survey, Branch of Isotope Geology, *Box 25046, Denver Federal Center, Denver, Colorado* 80225 (9740-00384)

We plan to continue the study of Sm-Nd systematics in rocks from Stillwater Complex, Montana. Pb, U, and Th distribution in basalts will be determined. Pb and Nd isotopic compositions of Hawaiian rocks will also be determined with regard to the mantle evolution. We plan to study U-Th-Pb systematics and U isotopic composition of lunar and meteorite samples to compare its origin and history to the earth's evolution.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0018, INVESTIGATION OF THE CORE-MANTLE BOUNDARY, OF RAYLEIGH WAVE OVERTONES AND OF LOW-FREQUENCY BEHAVIOR OF SOURCES OF GIANT EARTHQUAKES
E.A. Okal, Yale University, Graduate School, *206 Elm, New Haven, Connecticut* 06520 (EAR79-03907)

This is a project for the investigation of attenuation and possible lateral heterogeneities at the Core-Mantle Boundary of the Earth, for the study of Rayleigh wave overtones as individual seismic phases, and for the investigation of the ultra-long period mechanism of some giant earthquakes using normal mode theory.

The principal investigator will also apply mode theory methods to other earthquakes, in particular to investigate quantitatively the proposed precursor to the giant 1960 Chilean earthquake; a preliminary analysis establishes the feasibility of such a study, which could have important consequences in our understanding of the kinematics of plate motion, and in dynamical problems such as the driving mechanism of the Chandler Wobble of the Earth.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Earth Sciences

5.0019, IDENTIFICATION OF PREFERRED DOUGLAS-FIR TUSSOCK MOTH SITES
R.C. Heller, University of Idaho, Forest Wildlife & Range Experiment Station, *Moscow, Idaho* 83843 (0070375; IDA-ES-0091)

OBJECTIVE: Produce correlative tree, stand and site information from color infrared aerial photographs which identify those factors which contribute to susceptibility of firs to Douglas-fir tussock moth epidemics.

APPROACH: The color infrared aerial photographs taken in 1974 will be interpreted to determine at each one-acre plot: Level of tussock moth defoliation damage; aspect of plot; slope of plot; height of dominant trees - age. Simple and multiple regressions will be made along with discriminant analysis techniques to test our hypotheses.

PROGRESS: Aerial color infrared photographs (scale 1:5,000) are being interpreted to determine whether the level of Douglas-fir tussock moth damage to fir stands in Oregon is related to aspect, tree age, stand density, slope, physiography, and/or stand openness. Approximately one-sixth of the photo interpretation is complete. Data are being recorded for rapid computer analysis. We have determined that tree height is poorly correlated with age. This is based on height and age measurements of 425 fir trees in the Umatilla National Forest, which is within our study area.

SUPPORTED BY U.S. Dept. of Agriculture, Cooperative Research Office, Idaho

5.0020, IMPROVING SURFACE-COAL REFUSE DISPOSAL SITE INSPECTIONS

R. Meister, Chicago Aerial Survey, *2140 Wolf Rd., Des Plaines, Illinois* 60018 (J0188027; L-77-C)

PURPOSE: Demonstrate the practicality of aerial photogrammetry for supplementing MSHA inspection of coal-waste structures in Appalachia.

SUPPORTED BY U.S. Dept. of the Interior, Bureau of Mines, Spokane Mining Research Center

5.0021, SEASAT PROGRAM - RESEARCH APPLICATIONS WITH TROPICAL CYCLONE DATA SETS

R.C. Gentry, General Electric Co., Management & Technical Services, *5030 Herzel Pl., Beltsville, Maryland* 20705 (7-931; MOAO1-78-00-4323)

OBJECTIVES: Use wind, temperature and moisture measurements from SMMR and SASS, together with all other available data sets taken over three tropical cyclones, to evaluate usefulness of SEASAT-A for hurricane observations. Compare value of this full data set with requirements for making hurricane forecasts.

APPROACH: SEASAT data will be obtained on a moderate disturbance, a tropical storm and a tropical cyclone of full hurricane intensity. All three cases will be selected to insure maximum data availability, but the full hurricane case would further cover periods when the geosynchronous satellite is operating in the limited scan mode for the storm area and the NOAA Research Flight Center has one or more of its aircraft gathering data in the storm at low levels. Data from all sources will be intercompared in order to assess data validity and to set limits on probable errors in the various types of data. These data would then be used to study the structure and energetics of the three storms of varying intensity.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Environmental Satellite Service

5.0022, NAVY ENVIRONMENT - UNDER-ICE ROUGHNESS

L.A. Leschack, Leschack Associates Ltd., *1111 University Blvd. W., Silver Spring, Maryland* 20902 (DN675351; N00014-76-C-0757)

The objectives of the proposed work are: (a) to evaluate the geographical and temporal variability of the under-ice roughness parameters in the Arctic Ocean; (b) to determine if the roughness parameters seem to remain relatively constant with respect to one another for different geographical areas from year to year, thence to determine whether this geographical variability can be well correlated with ridging intensity measurements derived from airborne data; (c) to determine whether under-ice roughness parameters can be estimated from satellite data.

Examine under-ice roughness parameters for geographical and temporal variability to determine quantitatively whether roughness variations can be grouped geographically. Attempt to correlate latest recorded under-ice roughness data with corresponding satellite data of the surface.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

5.0023, *SYSTEMS DEVELOPMENT AND EXPERIMENTATION* - FORECASTER AIDS AND APPLICATIONS

H.M. ONeil, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Weather Service, Systems Development Office, Integrated Systems Laboratory, *8060 13th St., Silver Spring, Maryland* 20910 (8C27037)

OBJECTIVE: To enhance the capability of forecasters at NWS operational sites through the use of new or improved products and the extended use of automation to provide these products.

APPROACH: Define the requirements for new or improved products and translate these requirements into AFOS-compatible software. Analyze man-machine interaction and optimize the software through experimentation.

PROGRESS: 1. Aviation Information and Retrieval System (AIRS) completed. 2. Evaluation of computer worded forecasts is underway. 3. Evaluation of Terminal Alerting Procedure (TAP) has begun.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Weather Service

5.0024, MARINE ENVIRONMENTAL PREDICTION - GREAT LAKES FORECASTING

N.A. Pore, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Weather Service, Systems Development Office, Techniques Development Laboratory, *8060 13th St., Silver Spring, Maryland* 20910 (8C698203)

OBJECTIVE: 1. Wind--Develop and improve automated forecast techniques for winds over the Great Lakes. 2. Storm Surge--Expand and improve automated storm surge forecast technique. 3. Waves--Expand and improve the automated Great Lakes wave forecast system. 4. Fog--Develop automated technique for forecasting reduced visibility due to fog.

APPROACH: 1. A statistical approach will be taken to relate observed winds over the Great Lakes to atmospheric model output of LFM-II (MOS approach). Effects of low level atmospheric stability will be included. 2. Great Lakes storm surges will be related statistically to atmospheric circulation and stability by perfect prog and MOS techniques. 3. Great Lakes wave forecast technique will be modified by considering reduced fetch lengths due to ice. 4. A statistical approach will be used to relate observed reduced visibility due to fog occurrence to atmospheric model output.

PROGRESS: 1. Wind forecasts are made twice daily for 12 sections on the Great Lakes, based on LFM-II meteorological input data. 2. Extratropical storm surge forecasts are made twice daily for four locations, two on Lake Erie and two on Lake Huron. 3. Operational wave forecasts to 36 hours in advance are made twice daily for 64 locations on the Great Lakes. 4. Preliminary equations have been developed for probability of occurrence of fog on the Great Lakes.

SUPPORTED BY U.S. Dept. of Commerce, National Weather Service, Systems Development Office

5.0025, CLOUD/ICING/VISIBILITY ANALYSIS SYSTEM (CIVAS)

W.D. Mount, Geo Atmospherics Corp., *Box 117, Lincoln, Massachusetts* 01773 (DA0F2203; DAAD07-79-C-0089)

To provide Army aviators with an automated procedure for estimating the current threat of icing conditions on a scale of 5 km.

Existing computer programs for analyzing cloud and visibility conditions from standard airways and synoptic observations will be modified to add temperature/icing and reduce the grid size of 5 km.

SUPPORTED BY U.S. Dept. of Defense, Electronics Research & Development Command, Atmospheric Sciences Lab.

5.0026, THE CHEMISTRY AND CHEMICAL EVOLUTION OF PLANETARY ATMOSPHERES

R.G. Prinn, Massachusetts Inst. of Technology, School of Science, Dept. of Meteorology, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (ATM77-01252)

This grant funds a theoretical and modeling study of the chemistry and chemical evolution of planetary atmospheres. Particular areas to be emphasized include photochemical models of the atmospheres of Venus, Mars, Jupiter, and Uranus, and the development of a unified theory of the origin and evolution of planetary atmospheres. This work is a follow-up to earlier work supported under NSF grant ATM-7414116.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

5.0027, COASTAL MONITORING ASSESSMENT AND PREDICTION (COMAP)

G.F. Kelly, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Marine Fisheries Service, Northeast Fisheries Center, Woods Hole, Massachusetts 02543 (NEC-001)

The objectives of the COMAP task are three-fold: 1) To monitor the distribution and abundance of key ocean pulse-indicator species of fish and invertebrates in Buzzards Bay, Vineyard Sound and other coastal waters of New England; 2) To assess man's impact on the in-shore environment employing ocean pulse procedures to determine the state of health of fish and invertebrates in relation to contaminants in inshore waters, and 3) To provide coordination for environmental studies within the northeast state, federal and private agencies that are interested in coastal environmental investigations or related fisheries studies. Examples of specific studies employing the 38 ft. NMFS survey boat Phalarope II in in-shore waters include monitoring the abundance of green crabs, Carcinus maenes; edible mussels, Mytilus edulis; barnacles, balanus sp; and periwinkles, Littorina sp; as potential indicators of hydrocarbon, PCB and heavy metal contamination. Samples of finfish and invertebrate specimens will be collected for chemical and physiological analyses at the NMFS Milford Biological Laboratory, Sandy Hook Laboratory, and the Gloucester Laboratory, Northeast Fisheries Center, or by investigators engaged in research contracts awarded to academics and other government agencies. Regular otter trawl surveys of finfishes will be done in the vicinity of Woods Hole for comparison with earlier data and to establish long-term trends in species abundance and contaminant concentration. Sampling will be continued in Buzzards Bay and Vineyard Sound, using newston and plankton sampling gear, to measure the essential abundance of lobster larvae and eggs and larvae of other associated finfish and invertebrates. Studies of water column will be done at selected stations in conjunction with the above laboratories (NES-037, 040 and 070). Arrangements have been made to coordinate surface water ground-truth observations from Phalarope II with NASA remote sensing flights over southern New England in March 1979. The coordination role of COMAP is directed principally toward implementing ocean pulse procedures in ongoing studies such as the 'Massachusetts coast-wide fisheries resource assessment' and EPA 'Mussel watch' or assisting academic teams of investigators, through contract, in initiating specialized environmental studies.

SUPPORTED BY U.S. Dept. of Commerce, National Marine Fisheries Service, Northeast Fisheries Center

5.0028, CALIBRATION OF MEASUREMENTS OF ATMOSPHERIC EMISSIONS

M.R. Torr, University of Michigan, Ann Arbor Campus, School of Literature Science & the Arts, Dept. of Atmospheric & Oceanic Sciences, *Ann Arbor, Michigan* 48104 (ATM76-23737 A01)

Weak emissions from the earth's atmosphere can be observed at certain wavelengths, by sensitive photometric devices looking at the nighttime sky. These nighttime airglow features are the data base used by a large number of researchers, across the country and around the world, to learn about chemical reaction rates, atmospheric and ionospheric concentrations, and other geophysical phenomena.

A problem for such work in the past has been one of absolute calibration of the photometric devices, and thus of derived parameters. Even some (claimed) strong geographical dependencies in observed effects have been subsequently found due simply to differences in 'absolute calibration' references used at different observatories. One traveling reference for universal intercomparison has proven most valuable to the field.

This grant provides the continued availability of a portable photometric calibration instrument to the atmospheric-emission-measurement community. In particular, this grant funds (in addition to on-going calibration of sources): a) Absolute calibration of the reference photometer and transfer standard against the National Bureau of Standards tungsten source. b) Subsequent derivation of an absolute calibration for each of the sources calibrated to date, and preparation of a summary report for distribution to the participants. c) Availability of the photometer at the calibration workshop to be held at the International Association of Geomagnetism and Aeronomy meeting, Canberra, 1979 and presentation of a report at the same meeting.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical *Atmospheric Earth & Ocean Scis., Div.* of Atmospheric Sciences

5.0029, MODIFICATIONS TO SOLID SOURCE MASS SPECTROMETER

V.R. Murthy, University of Minnesota, Minneapolis Campus, School of Earth Sciences, Dept. of Geology & Geophysics, *105 Morrill Hall, Minneapolis, Minnesota* 55455 (EAR78-25198)

This provides funds to upgrade the solid source mass spectrometer in the Department of Geology and Geophysics at the University of Minnesota. The upgrading will permit high precision Rb-Sr and Sm-Nd measurements to be carried out to a higher accuracy and precision, on a wide variety of geological samples. The equipment will be used in support of studies on meteorites, lunar samples and terrestrial silicate rocks and minerals.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Earth Sciences

5.0030, FORMATION OF ATMOSPHERIC AEROSOLS

K.T. Whitby, University of Minnesota, Minneapolis Campus, School of Engineering, Dept. of Mechanical Engineering, *105 Morrill Hall, Minneapolis, Minnesota* 55455 (R803851-03; G603A-AC-007)

Aerosol size distributions have been measured in the St. Louis area as part of EPA's Project MISTT using aircraft and ground-based, self-contained mobile laboratories. The University of Minnesota's portion of the project included aerosol measurements aboard an aircraft and the operation of a mobile van on the ground under the plumes.

The past year was devoted primarily to data analysis, the development of new analysis techniques and reporting results of aerosol data obtained over the past several years in Project MISTT and the Roadway Aerosol Study.

During the coming year the Particle Technology Laboratory of the University of Minnesota will be measuring aerosol size distributions for EPA's Project STATE (Sulfur Transport and Transformation in the Environment) in Tennessee and for EPA's Project SCRUB in Alabama and Minnesota. The STATE Program is directed to describing reactions and atmospheric processes affecting plume behavior over time scales of 12-96 hours and distances out to 1000 km. By contrast the SCRUB program will provide an assessment of the transport and transformation occurring within a power plant plume with an SO2 scrubber out to distances of about 1000 km and travel times mostly less than 12 hours.

Resources will be provided to complete data analysis and report on Project MISTT and to participate in the planning of Project SCRUB and the subsequent data analysis. Other tasks include the measurement of gaseous and aerosol pollutants under and in plumes being characterized in Project STATE and development of an aerosol mobility chromatograph to determine molecular composition of sulfur-containing aerosols.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Environmental Sciences Research Lab.

5.0031, PROGRAMMED IDENTIFICATION AND MAPPING OF FOREST AND HABITAT CATEGORIES

B.O. Benn, U.S. Dept. of Defense, Army, Corps of Engineers, Waterways Experiment Station, *P.O. Box 631, Vicksburg, Mississippi 39180 (51584(1))*

OBJECTIVE: The objective of this study is to demonstrate the feasibility of identifying and mapping forest and habitat categories by programmed recognition procedures using digital multispectral scanner data. Emphasis will be placed on Corps data needs relating to runoff and flood damage computations, floodplain information studies, and river basin planning.

APPROACH: The literature and pertinent government agencies will be scanned to determine the success of previous applications of digital image processing to mapping forest and habitat categories. Corps offices will be contacted to establish specific forest and habitat data needs and these needs will be used to define mapping classes of interest. The spectral and spatial properties of the vegetation constituents comprising the various map classes will be examined to establish the best criteria for discrimination of the desired classes using digital image processing techniques. Available digital image processing codes such as those in use at NSTL, EROS Data Center, and major universities will be scanned to select those best meeting the criteria established as best for discrimination of the desired forest and habitat classes. The codes selected will be applied to LANDSAT and thematic mapper type image data for selected test areas. Forest and habitat class maps produced from the image data will be compared to ground truth data to assess the performance of the digital image processing codes for acquiring forest and habitat data for Corps needs. Previous work at the WES on characterizing habitats of sensitive and endangered species, and preparation of habitat and range maps for specific species will be an integral part of the study effort. Test areas will be chosen to take advantage of previously acquired ground truth data. A report will be prepared documenting the study effort and providing guidance for application of mapping techniques that will meet Corps data needs. Initial emphasis will be placed on mapping forest categories with later efforts expanded to include the more complex problem of identifying and classifying habitats. This work addresses Mission Problem Nos. 2-1-54, 2-1-61, and 2-1-42.

SUPPORTED BY U.S. Dept. of Defense, Corps of Engineers, Waterways Experiment Station

5.0032, SULFUR BUDGET IN POWER PLANT PLUMES - PROCESSING, MANAGEMENT AND ANALYSIS OF PROJECT STATE DATA

N. Gilloni, Washington University, School of Engineering & Applied Science, Dept. of Mechanical Engineering, *4559 Scott Ave., St. Louis, Missouri* 63130 (R805918-01; G603A-AA-015)

OBJECTIVE: This project continues the tasks performed during the first year of the grant, i.e. processing, management and analysis of data collected as part of the August 1978 Tennessee Plume Study (Phase I of Project STATE). Similar responsibilities will be undertaken for the Cold Weather Plume Study (Phase II of Project STATE).

APPROACH: Specific tasks include: (1) Software organization and development. (2) Data base system design and implementation, (3) Data analyses and model development, (4) Preparation for, and participation in, the STATE Cold Weather Plume Study field program, and (5) Production of an Aircraft Data Volume.

PROGRESS: Took part in Tennessee Plume Study, Summer 1979: Participated in Mission control activities, performed on-site data reduction, data validation and data volume production, data management, data analysis and produced a data volume for EMI aircraft, EPA/EPRI Plume Study, 1977.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Environmental Sciences Research Lab.

5.0033, REMOTE INSTRUMENTAL TECHNIQUES FOR MONITORING ENERGY-RELATED AIR POLLUTANTS

J.A. Eckert, U.S. Environmental Protection Agency, Office of Research & Development, Environmental Monitoring & Systems Lab., *P.O. Box 15027, Las Vegas, Nevada* 89114 (J833C-078)

OBJECTIVE: Assemble, test and report on an operational Raman downward-looking lidar incorporating real-time normalization of the MIE-scattered return using the Raman N2 return. Demonstrate Raman normalized technique in pristine areas in the vicinity of energy resource development and establish historical data base.

APPROACH: One solution to quantifying the airborne lidar returns is to simultaneously measure the Raman return from N2 molecules and the scattered return from particulates. The N2 distribution is known, and thus lidar returns made at different places and times can be compared.

PROGRESS: Lidar system has been constructed for use as test frame in Raman N2 experiments. Software has been written to simulate lidar returns for aid in system decision.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Environmental Monitoring & Systems Lab.

5.0034, DEVELOPMENT OF ENVIRONMENTAL KEYS

V. Webb, U.S. Environmental Protection Agency, Office of Research & Development, Environmental Monitoring & Systems Lab., Environmental Photographic Interpretation Center, *P.O. Box 15027, Las Vegas, Nevada* 89114 (J883A-038)

OBJECTIVE: Develop aerial photography interpretation keys as analysis aids for novice and experienced photo-interpreters, to examine photography for environmental characteristics, impacts and trends.

APPROACH: Using aerial photography collected for environmental assessment studies in support of EPA program and regional office, prepare guideline reports and photo displays for training and reference material, describing various environmental sites, areas, pollution sources, and environmental impacts.

PROGRESS: Photo interpretation guidelines on harbor pollution sources and detection of leachate from waste disposal sites.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Environmental Monitoring & Systems Lab.

5.0035, TSUNAMI NETWORK SUPPORT

H.E. Clark, U.S. Dept. of the Interior, Geological Survey, Albuquerque Seismological Laboratory, *Albuquerque, New Mexico* 87106 (9920-01263)

STATES TO WHICH PROJECT PERTAINS: New Mexico, California and Alaska.

The objectives to be sought in the current fiscal year are to operate Tide Systems and the TS-4 Seismic systems over the GOES SMS satellite network. The TT 2 Tide Systems will be operationally evaluated in an actual NWS facility located in La Jolla, California. The Tsunami Seismic Systems will be operationally evaluated in a realistic system configuration at the Albuquerque Seismological Laboratory, Albuquerque, New Mexico. Various parameters in the event detection and validation unit will be tested for optimum event detection for various types of earthquakes as to size and distance from the TS-4 Seismic System. Each microprocessor type TT-2 Tide and TS-4 Seismic System will be operated over the GOES SMS Satellite Network. The major equipment objective is to develop low-cost reliable new instrumentation for use in a proposed Tsunami Warning Network. Evaluation of the operation of ten new TT-2 Tide systems and two TS-4 Seismic Systems installed around the Pacific area will be performed.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0036, NE REGIONAL OXIDANT STUDY - AIRCRAFT MEASUREMENTS

L. Newman, Brookhaven National Lab., *Upton, New York* 11973 (D9-X0737; G603A-AD-036)

OBJECTIVE: The objective of this task is to obtain continuous measurements of O3, SO2, NOx, b-scat, and integrated hydrocarbon canister samples on a regional scale during a five-week field program.

APPROACH: The measurements will be made from an instrumented aircraft provided by the Brookhaven National Laboratory.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Environmental Sciences Research Lab.

5.0037, OCEANOGRAPHY AT THE CONFLUENCE OF THE FALKLAND AND BRAZIL CURRENTS

A.L. Gordon, Columbia University, Lamont Doherty Geological Observatory, *Palisades, New York* 10964 (OCE78-23860)

This project will collect, process, and analyze a relatively dense network of physical oceanographic data to be taken in the vicinity of the abrupt boundary separating the Subtropical and Subantarctic water mass regimes in the western Argentine Basin of the South Atlantic Ocean. This boundary region if known as the Subantarctic Frontal Zone. The field work will be carried out aboard the R/V Atlantis II during a 35-day period in later 1979. The primary objectives of this project are: 1) to determine the thermohaline and chemical characteristics both at the Subantarctic Frontal Zone and within the Falkland and Brazil Current systems on either side of the front in order to identify the water masses encountered, and 2) to determine the continuity of these water masses across the front in order to study the circulation and transport processes in the vicinity of the front. The secondary objective is to determine the structure with depth of an eddy structure associated with the Subantarctic Frontal Zone. To meet these objectives the project plans to obtain hydrographic and nutrient data from stations along three east-west lines from Argentina's outer continental shelf to 45 degrees W. Stations will be spaced at average intervals of 25 nautical miles but will be closer together in the vicinity of the front. Upon completion of the 3 transects a 3-day period will be devoted to obtaining an array of stations within an eddy or strong frontal position of the Subantarctic Front, as located by satellite observations.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Ocean Sciences

5.0038, RUBIDIUM-STRONTIUM AGE STUDY OF PROTEROZOIC SHEAR BELTS IN WEST GREENLAND

N.K. Grant, Miami University, School of Arts & Sciences, Dept. of Geology, *Oxford, Ohio* 45056 (DPP77-23880 A01)

Miami University of Ohio will continue investigation of the radiometric ages of Proterozoic shear belts of West Greenland begun under Grant DPP 77-23880. Field research in 1977 was carried out in cooperation with geologists from Great Britain and Denmark, without NSF support. The 1978 field season was used to collect samples from within and adjacent to shear belts in the Nordre Stromfjord and Evighedsfjord regions. The objectives of this project are Rubidium-Strontium age dating and the determination of the thermal-tectonic histories of four major shear belts and the adjacent crustal blocks. The isotopic studies will be carried out in the geology laboratories of Miami University. The results of the isotopic studies of the samples will yield an age framework for the aerial geological and structural studies of a five-year joint project in the region by scientists from Great Britain and Denmark, sponsored by the Greenland Geological Survey.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Polar Programs

5.0039, USE OF SEASAT-A ALTIMETER DATA FOR THE IMPROVED DETERMINATION OF THE GEOID, GRAVITY ANOMALY FIELD AND SEA SURFACE TOPOGRAPHY

R.H. Rapp, Ohio State University, Columbus Campus, School of Mathematics & Physical Sciences, Dept. of Geodetic Science, *164 W. 17th Ave., Columbus, Ohio* 43210 (7-929; MO-A01-78-00-4326)

OBJECTIVE: Determination of more reliable values of ocean gravity and ocean geoids than are available from GEOS-3, using SEASAT's better accuracy and coverage.

APPROACH: The general approach will be the same as was used in the processing of GEOS-3 data. The bias removal and orbit error will be examined by fitting to a known long wavelength surface and introducing crossover constraints. This part of our study should improve sea surface determinations to better than the 1-2 m level expected from the initial orbit determination. More detailed error models than used in our GEOS-3 processing will be examined. The outcome from this will be a set of sea surface topography values from which gravity anomaly information can be obtained. In this case there will be a need to use a more precise formulation of this problem and possibly use some of the techniques suggested by Lelgeman although previous success with least square collocation in anomaly processing may indicate that this method should be improved for use with the SEASAT data.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Environmental Satellite Service

5.0040, BOUNDARY LAYER MODEL IMPROVEMENT AND VALIDATION

A.K. Blackadar, Pennsylvania State University, University Park Campus, School of Earth & Mineral Science, Dept. of Meteorology, *116 Deike Bldg., University Park, Pennsylvania* 16802 (R806048-0152; G603A-AB-019)

OBJECTIVE: 1. Model Surface Exchange Processes; 2. Model Planetary Boundary Layer, Wind, Temperature, Moisture Profiles; 3. Measure Wind, Temperature Profiles, along with other PBL characteristics.

APPROACH: Simplified numerical models will be compared with field data and other existing data sets.

PROGRESS: Models completed and being refined - data being taken.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Environmental Sciences Research Lab.

5.0041, STUDIES OF THE ENVIRONMENTAL IMPACT OF EVAPORATIVE COOLING TOWER PLUMES

J.M. Norman, Pennsylvania State University, University Park Campus, School of Earth & Mineral Science, Dept. of Meteorology, *116 Deike Bldg., University Park, Pennsylvania* 16802 (6815; EY-76-S-02-2463)

The objectives of this research are to characterize the environmental effects of evaporative cooling tower plumes. This involves obtaining a variety of field data around the Keystone-Connemaugh power plant in SW Pennsylvania such as: (a) plant operating conditions as inputs to a plant energy balance model to specify the tower as a source of heat and moisture for plume model validation studies; (b) temperature and droplet concentrations inside towers to relate environmental effects to tower characteristics; (c) aircraft turbulence measurements of temperature, water vapor and vertical velocity inside plumes for tests of plume model predictions and a better understanding of plume behavior; (d) surface-based Doppler Sodar measurements; (e) drift-drop size distribution measurements in plumes; (f) measurements of aerosol size distributions, particle identification and SO2 in merging stack and cooling tower plumes to define the sulfur balance in this region and predict deposition of sulate; and (g) measurement of ambient conditions from the surface to 10,000 feet altitude to provide background information for models. Techniques utilized include: (1) measurements within cooling water; (2) ground-based measurements such as with the Sodar equipment; and (3) use of instrumented aircraft for plume measurements of temperature, velocities, drift particle size, and SO2 concentration.

SUPPORTED BY U.S. Dept. of Energy, Office of Health & Environmental Research

5.0042, MEASUREMENT OF IMPORTANT MINOR CONSTITUENTS IN THE MIDDLE ATMOSPHERE 13877-GSX

J.J. Olivero, Pennsylvania State University, University Park Campus, School of Earth & Mineral Science, Dept. of Meteorology, *116 Deike Bldg., University Park, Pennsylvania* 16802 (DA0E9107; DAAG29-78-G-0083)

To investigate the concentration of trace constituents in the middle atmosphere (30-110 kilometers). The work will include, but not be limited to - (1) investigation of feasibility of sensing water vapor in the middle atmosphere; (2) improvement in current models of micro-particle concentration profiles in the D-

region; and (3) recommendation of techniques for direct measurement of micro-particles to establish their existence in the D-region. Better understanding of stratospheric and mesospheric processes is necessary for more accurate prediction of the effects of a perturbed atmosphere on transmission of electromagnetic signals utilized in Army systems.

(1) A comprehensive overview of current aeronomic models will be completed, including compilation of the important and potentially important minor constituents in the middle atmosphere. Recommendation of measurement methods will be made. (2) A simple structural model of the normal D-region, specifying charged particle composition will be formulated including estimations of micro-particle concentrations which are fundamental to ion charges and mobilities.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

5.0043, OCEAN CLIMATOLOGY AND MONITORING
M.C. Ingham, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Marine Fisheries Service, Northeast Fisheries Center, *Narragansett, Rhode Island* 02882 (NEC-084)

This task conducts studies of marine environmental conditions in the western North Atlantic and Gulf of Mexico, principally in coastal areas, utilizing climatological data bases and recent monitoring data, some of which are collected by task members. The understanding of environmental variation gained through these efforts is applied to studies of the effects of this variation on the distribution and abundance of living marine resources. Current year objectives include the following: 1) completion of a temperature climatology for EH Middle Atlantic Bight; 2) continued expansion of the ship of opportunity program for monitoring subsurface conditions; 3) continued surveillance of satellite data for determining the trajectories of warm core eddies passing through the slope water mass along the outer continental shelf; 4) continued accumulation and analysis of climatological data for Georges Bank and the Middle Atlantic Bight; 5) description and analysis of unusual shelf water conditions during the spring and summer of FY 1978; 6) surveillance and analysis of the shelf water for repetition in FY 1979; 7) completion of analysis of deep water replenishment in the Gulf of Mexico; 8) completion of study of relationship between environmental conditions and distribution of Menhaden Larvae in Onslow Bay, NC; 9) beginning of study of bottom water oxygen cycle during years following 1976 anoxic conditions in the New York Bight; 10) development and initiation of new cooperative studies with the SEFC; 11) develop and pursue cooperative fishery climatology studies with EDIS/CIAD and the NEFC; 12) continue efforts to describe seasonal variations in the cold cell on the middle Atlantic bight shelf; 13) continue support of the cooperative study of Blue crab climatology with VIMS and NEFC; 14) complete the development and initiate operational use of the undulating oceanographic recorder; 15) begin analyses and produce first reports on long-term variations in plankton and environmental features off Chesapeake Bay and in the Gulf of Maine and Eastward, from CPR samples; 16) completion of MARMAP OTP descriptive summaries; and 17) complete routine interfaces from MIS data base to statistical and graphical software libraries and from other data bases to the MIS data base.

SUPPORTED BY U.S. Dept. of Commerce, National Marine Fisheries Service, Northeast Fisheries Center

5.0044, DYNAMICS OF GULF STREAM MEANDERS
R.D. Watts, University of Rhode Island, Graduate School of Oceanography, *Administration Bldg., Kingston, Rhode Island* 02881 (OCE78-09655 A02)

This project will study the dynamics of the Gulf Stream as the Stream leaves the continental margin at Cape Hatteras and flows into deep water. In this region meanders develop and grow in an envelope increasing downstream. At present, both theoretical and observational inconsistencies exist regarding the structure and development of Gulf Stream meanders. This project involves specific tests to resolve these conflicts including analysis of a large set of existing temperature data, utilization of data produced concurrently from existing program (e.g., satellite infrared imagery), and collection of new data from an array of deep current meters and inverted echo sounders, instruments which are particularly well-suited for monitoring the position of the Gulf Stream.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Ocean Sciences

5.0045, MODEL DEVELOPMENT FOR PREDICTING SOIL MOISTURE BY THERMOGRAPHY
J.A. Tunheim, South Dakota State University, School of Engineering, Dept. of Physics, *Brookings, South Dakota* 57006 (A-063-SDAK)

The proposed research involves theoretical and experimental investigations relating to the measurement of near-surface soil moisture by the use of remotely sensed thermal emittance. The general approach is to modify and use a heat flow model to calculate soil moisture differences from surface temperature deviations caused by the change in soil thermal properties with moisture content.

Field investigations will include the measurement of soil temperature profiles during the diurnal cycle together with soil moisture and thermal emittance. These measurements will be made on irrigated plots with several types of crop cover to delineate the role of the crop canopy in altering temperature patterns during nighttime hours. The temperature and soil moisture data will then be used to calculate parameters in the model needed to predict thermal emittance. Application of the model developed in this project will then be made to the interpretation of thermal data from earth resources satellites. Recommendations will be made pertaining to the use of thermal emittance data in irrigation scheduling.

SUPPORTED BY U.S. Dept. of the Interior, Office of Water Research & Technology

5.0046, TARGETING MINERAL EXPLORATION EFFORT
J.V. Taranik, U.S. Dept. of the Interior, Geological Survey, Land Information & Analysis Office, EROS Data Center, *Sioux Falls, South Dakota* 57198 (E-0018)

To demonstrate the usefulness of remote sensing data, geophysical data and data analysis techniques for targeting exploration effort, development of exploration plans, and rating the development of known mineral deposits in the light of environmental factors. Test sites have been selected in different geographic settings where petroleum and mineral deposits have been defined by ground exploration effort. Existing remotely sensed data and geophysical data will be evaluated in different scales, accuracies, and formats using different data analysis techniques. Characteristics of the data and principles of data analysis will be identified in the light of exploration information requirements. Conceptual geologic exploration models will be developed that will enable known deposits to be targeted from remote sensor and geophysical information. Areas where mineral deposits are suspected will then be targeted for ground-based exploration using the developed techniques. Success of the targeting procedures will be demonstrated through on-the-ground investigations. Training courses in the application of developed techniques will be conducted for government and industry personnel.

SUPPORTED BY U.S. Dept. of the Interior, Land Information & Analysis Office, EROS Data Center

5.0047, SEASAT PROGRAM - SOIL MOISTURE/SCATTEROMETER/SAR CORRELATION
B.J. Blanchard, Texas A & M University, College Station Campus, Texas Engineering Experiment Station, Remote Sensing Center, *College Station, Texas* 77843 (K7-975; MO-AO1-78-00-4332)

OBJECTIVE: To determine the range of the scattering coefficients (sigma o) received from SAR for all field conditions

from dry to saturated and compare SAR AND 1.6 GHz scatterometer sigma o values over the same field conditions. The results are expected to aid in the evaluation of the SEASAT-SAR's sensitivity to differences in soil moisture.

APPROACH: In order to establish the influence of soil moisture on data collected by the SEASAT SAR, three major categories of data will be obtained: ground samples, aircraft 1.6 GHz scatterometer sigma o values, and digitized SAR imagery. Data analysis will be directed toward the following major considerations: 1. Is the influence of soil moisture differences a major factor in the interpretation of the SEASAT SAR imagery? 2. How well does the SAR data correlate to measured soil moisture differences? 3. How well does the SAR data correlate to scatterometer data?

CURRENT PLANS AND/OR PROGRESS: Complete negotiations and execute a contract by Sepember 30, 1978.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Environmental Satellite Service

5.0048, COMMERCIAL AIRCRAFT DATA COLLECTION FOR MONEX
E.G. Astling, Utah Higher Education System, University of Utah, School of Mines & Mineral Industry, Dept. of Meteorology, *1400 E. 2nd S., Salt Lake City, Utah* 84112 (ATM7819895)

The objective of this project is to collect, digitize and archive flight level commercial aircraft wind and temperature observations over the south and southeast Asian Monsoon Experiment (MONEX) region. MONEX is a regional subprogram of the Global Atmospheric Research Program (GARP) which will occur at the same time as the First GARP Global Experiment (FGGE) also known as the Global Weather Experiment. The observations will be collected during two (summer and winter) intensive Special Observing Periods (SOP's) of one month each.

The data will be made available to MONEX scientists who will use them to supplement the other conventional and special observations collected during MONEX. They will also be used primarily for global numerical weather simulation and prediction work.

Aircraft crews will be asked to take the observations at 250 km. intervals along the flight tracks whenever the aircraft are above 6 km. The observations will consist of wind direction and speed and air temperature with time, altitude and location data. About 100 aircraft are equipped with automated data processing systems. These data will be added to the observations collected by crews on other aircraft to enhance the total data set.

MONEX is an experiment to increase understanding of the dynamics and thermodynamics of the atmosphere and ocean in the monsoon region of the world where the local monsoon wind and precipitation regimes are the most energetic on the globe. The Global Weather Experiment is designed to test and improve computerized global weather prediction models.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

5.0049, LIGHT SCATTERING AND RADIATIVE TRANSFER BY ICE CLOUDS
K. Liou, Utah Higher Education System, University of Utah, School of Mines & Mineral Industry, Dept. of Meterology, *1400 E. 2nd S., Salt Lake City, Utah* 84112 (ATM7826259)

This project is a program of experimental and theoretical research on light scattering by nonspherical ice crystals. It includes the experimental determination of the single-scattering parameters and phase matrix for artificial ice crystals with various shapes and sizes for wavelengths in the solar and infrared spectral regions through controlled laboratory experiments.

The research also involves the theoretical evaluation of the single-scattering and polarization parameters for hexagonal crystals by means of the geometrical ray tracing and the numerical method for symmetrical particles.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

5.0050, PLANETARY MINERALOGY
P. Toulmin, U.S. Dept. of the Interior, Geological Survey, Geologic Division, *12201 Sunrise Valley Dr., MS 912, Reston, Virginia* 22092 (9710-00954)

The project is concerned with mineralogical studies of extraterrestrial planetary bodies by theoretical and remote analytical methods. Principal emphasis is on the analysis of Martian surface materials by means of two instruments on the Viking Mars Landers: an X-ray fluorescence spectrometer for elemental analysis of surface samples, and a gas chromatograph-mass spectrometer; the latter, in addition to its primary applications to the organic analysis of the Martian 'soil' and the analysis (by MS alone) of the Martian surface atmosphere, has provided useful data on volatile inorganic constitutents of the Martian surface. Laboratory simulations will be an important activity in FY 79. Active operation of the X-ray fluorescence spectrometers on Mars continues but is scheduled to end in January.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0051, URBAN POLLUTION CHARACTERISTICS, TRANSPORT AND DEPOSITION
J.A. Young, U.S. Dept. of Energy, Battelle Pacific Northwest Lab., *P.O. Box 999, Richland, Washington* 99352 (000540; EY-76-C-06-1830)

This project is designed to determine the nature and quantities of various energy-related pollutants which are emitted to the atmosphere, to determine the rates of transport and diffusion and deposition on the earth's surface, and the chemical and physical transformations during transport. The data obtained are used to develop parametrizations of the various processes for incorporation into numerical models which will then be tested and validated. Inert tracers are introduced into urban plumes or advantage is taken of the presence of inert atmospheric tracers (CO or fluorocarbons). Concentrations of these tracers and urban pollutants, like SO2, particulates, NOx, are then measured at various downwind distances using aircraft or ground-level vehicles. Data for various times and distances permit elucidation of the processes which are operative.

SUPPORTED BY U.S. Dept. of Energy, Office of Health & Environmental Research

5.0052, FIELD ADVISORY PROGRAM DEVELOPMENT
R.E. Harris, University of Washington, Div. of Marine Resources, *Seattle, Washington* 98105 (A/FP-1)

OBJECTIVES: Provide for field advisory program development and interaction with other programs. 1. Start a new marine field agent and local advisory service on the Upper Olympic Peninsula, or at Fishermen's Terminal. Deciding which one involves additional discussion with industry and other leaders, experience with a satellite office at Fishermen's Terminal shared by existing field professionals, and the prospects for matching funds. TARGET DATE: 10/1/78. 2. Restructure the new Columbia River Marine field specialist from joint Washington/Oregon Sea Grant support to the emerging Columbia River Sea Grant program. The approach involves operation in a four-university consortium framework, with administration subcontracted to the WSU Cooperative Extension Service. TAAGET DATE: 2/1/78. 3. Continue to share talent with other Pacific Sea Grant programs.

ANTICIPATED BENEFITS: 1. Marine resource users in the Strait of Juan de Fuca and Puget Sound are going through radical change in their historical use patterns, brought on by too few fish to satisfy important competing needs, adjusting to the Boldt decision, and the still unknown impacts of the 200-mile limit--plus the increased risk of at least a four-fold increase in oil transported through northern Washington waters. With better information through marine extension educational programs, the users should be able to make better decisions in adjusting to these changes. 2. Columbia River resource users are also going through radical changes in their patterns, for reasons comparable to the above with the additional complication of too little stream flow to meet increasing needs for the river's waters. In this case the new marine specialist needs and will have the cooperation of major organizations already working various problems of the Columbia River, and access to the Cooperative Ex-

tension delivery systems and/or expertise of the Universities of Washington and Idaho, and Washington State and Oregon State Universities. To establish this, Bob Harris and Ken Hilderbrand visited, in addition to the universities, the following: Pacific Northwest Regional Commission; Pacific Northwest River Basins' Commission; Army Corps of Engineers; NMFS Columbia River Fisheries Development Program; Washington Water Research Center; NMFS Northwest and Alaska Fisheries Center.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Sea Grant Office

5.0053, COMMUNICATIONS - DETERMINING THE EARTH'S MAGNETOSPHERIC STATE FROM COSMIC RAY ANISOTROPIES
J.T. Ely, University of Washington, School of Arts & Sciences, Dept. of Geophysics, *Seattle, Washington* 98105 (DN775381; N00014-77-C-0392)

Geomagnetic storms degrade or disrupt naval communications, navigation, and surveillance systems. There is indirect evidence that connection of a southward interplanetary magnetic field to the geomagnetic field may trigger magnetic storms either through increased entry of solar wind particle flux, through stimulated field line reconnection, or some combination. This experiment will measure the change in geomagnetic configuration due to connection by detecting anisotropies in the galactic cosmic ray flux. If successful, short-term forecasts of geomagnetic activity could be possible. Periods of geomagnetic activity are associated with spacecraft charging events that have caused permanent or temporary spacecraft damage, possibly due to increased solar wind entry.

Data from the ONR-305 experiment on the S3-4 satellite will be analyzed and correlated with the interplanetary magnetic field, geomagnetic indices, and spacecraft charging events.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

5.0054, RURAL OXIDANT STUDIES AND THE ROLE OF NOX IN RURAL OXIDATION FORMATION
H. Westberg, Washington State University, School of Engineering, Dept. of Chemical Engineering, *Pullman, Washington* 99163 (R805343; G603A-AH-017)

OBJECTIVE: Ambient air measurements made for the detailed hydrocarbons, oxides of nitrogen, ozone, halocarbons and other pollutants by an aircraft and ground-level sampling program at several locations throughout the United States. The purpose of these studies is to investigate the transport and the transformation processes of pollutants in urban and rural areas.

APPROACH: Sophisticated state-of-the-art instrumentation is utilized in these studies for pollutant measurement. Both ground-level and aircraft sampling programs are utilized to investigate the transport of pollutants from an urban area to downwind rural or other urban areas.

PROGRESS: Several reports are available from past field study efforts by Washington State University. These reports in general identify the relationship between upwind urban transport to downwind high rural ozone levels. High rural ozone is associated with higher concentrations of transported O3 precursor compounds from anthropogenic sources.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Environmental Sciences Research Lab.

5.0055, EXPERIMENTS IN SMALL-SCALE SURFACE MODIFICATION
C.R. Stearns, University of Wisconsin, Madison Campus, School of Letters & Science, Dept. of Meteorology, *500 Lincoln Dr., Madison, Wisconsin* 53706 (ATM78-08437)

This project will conduct small-scale (2000 sq. m less) airmass modification experiments. The purpose is to obtain surface aerodynamic and insolation properties related to the surface structure (for example, surface roughness, albedo, and heat transfer coefficient) so that, given relatively simple meteorological measurements or assumptions, models can be constructed to interrelate the wind stress on and the sensible heat flux from the surface. The gust frequency distribution will be determined as a function of surface roughness. The horizontal pressure gradient around the obstacle field will be measured.

The field experiments will be conducted on the ice of Lake Mendota, Wisconsin, in two major categories: (a) momentum transfer studies using roughness modification by arrays of diverse types of obstacles (baskets, barrels, or small conifer trees) of various sizes and in a variety of patterns, (b) combined heat transfer and momentum transfer experiments using albedo differences (for example, black versus white baskets) in the presence of sufficiently strong insolation.

In addition, previously collected turbulence data will be analyzed about a change in surface roughness.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

5.0056, SURFACE TEMPERATURES AND TYPES, DISTRIBUTION AND MOVEMENT OF SEA ICE IN THE NORTH WATER AREA, 1973-1979
F. Muller, Eidgenossische Technische Hochule Zurich, *Leonhardstrasse 33, Zurich, Switzerland* (DPP78-26132)

This investigation of the large area of open water in northern Baffin Bay (the so-called 'North Water') consists of three coordinated phases: (1) a field phase of airborne remote sensing, (2) an analysis of satellite imagery, and (3) an assessment of the energy fluxes and sea ice dynamics of the area.

The objectives are to obtain the temporal variation of the radiation and heat balance at the air/sea/ice interface; the positions of open leads, refreezing zones, areas of open and consolidated pack ice, and pressure ridges; and to establish ground truth information for infrared satellite sensing of surface energy fluxes.

The project as submitted to NSF does not include field work support. The project is limited to the above phases (2) and (3) and can produce significant results in the event that the 1978-79 field program is not completely successful.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Polar Programs

LIFE SCIENCES

Includes Life Sciences (general); Aerospace Medicine; Behavioral Sciences; Man/system Technology and Life Support; and Planetary Biology.

6.0001, AVIATION MEDICINE RESEARCH FOR AIRCREW SELECTION, RETENTION AND PHYSICAL PERFORMANCE STANDARDS
F.S. Pettyjohn, U.S. Dept. of Defense, Army, Medical Research & Development Command, Aviation Medicine Research Div., *Fort Rucker, Ozark, Alabama* 36360 (DA0B6895)

To provide the US Army information concerning the medical requirements for Army aircrew selection, retention, and physical performance.

To apply accepted medical research methodology and technology to accomplish the objective.

SUPPORTED BY U.S. Dept. of Defense, Medical Research & Development Command, Aeromedical Research Lab.

6.0002, DEVELOPMENT AND EVALUATION OF SIMPLIFIED INSTRUCTION FOR THE ACQUISITION OF NORMAL LANDING AND WEAPONS DELIVERY SKILLS
B. Jones, U.S. Dept. of Defense, Air Force, Human Resources Lab., *Williams Air Force Base, Chandler, Arizona* 85224 (DF222030)

1. To compare the aim-point vs. visual impact point approach to final approach glidepath maintenance instruction. 2. To evaluate the segmented vs. whole task approach to teaching the 360 degree overhead pattern for: a. the landing task, and b. the 30 degree dive bomb task.

Two separate studies will be conducted on the ASPT using available personnel as subjects. Study I will compare aim-point

vs. impact point techniques of instruction on final approach glidepath control. Study II will compare two versions of task segmentation (forward and backward) *i.e.*, chaining, with the whole task approach to the normal overhead pattern for two tasks. One task will be the 360 degree overhead landing pattern, the other, the 30 degree dive bomb delivery task.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0003, ASPT AIR-TO-AIR COMBAT SIMULATION SOFTWARE DEVELOPMENT

E.G. Monroe, U.S. Dept. of Defense, Air Force, Human Resources Lab., *Williams Air Force Base, Chandler, Arizona* 85224 (DF223870)

To increase the training capability of the advanced simulator for pilot training in the area of air-to-air combat. To accomplish this, the visual system will be improved to simulate the visual effect of cannon and rocket fire and the effects of sunglint and glare.

The existing ASPT software will be modified to generate a simplified additional moving model. The present system of software will be utilized to simulate cannon and rocket fire from the viewpoint aircraft. Program scoring algorithms for scoring pilot performance will be developed for display on a vector general. Finally, hardware and software modifications to the ASPT system will be developed to simulate the visual effect of sun-glint off a lead aircraft and glare on the viewpoint windshield.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0004, INSTRUCTIONAL SYSTEMS DEVELOPMENT AND EVALUATION OF SITUATIONAL EMERGENCY TRAINING

A. Freedy, Perceptronics Inc., *6271 Variel Ave., Woodland Hills, California* 91364 (DF052200; F49620-78-C-0067)

AF function - this research develops information necessary to assess a new approach to training pilot responses to critical aircraft emergencies. Deficiency - traditional approaches to training emergency responses center around the memorization of boldface (critical) steps which have been identified as critical to the safety of flight. Unfortunately, these steps do not always apply to every emergency condition, requiring the use of pilot judgment. However, since the pilot has not been specifically trained to consider alternative steps in the presence of such extenuating circumstances, he is less likely to respond with an effective set of actions. These circumstances, defined as the 'situation', should somehow modify the pilot's response when necessary. Objective - this investigation will examine the effectiveness of situational emergency training as an alternative to traditional emergency procedures training, and will study ways to expand a situational approach to meet operational needs. How research contributes - the efficiency and effectiveness of situational approaches to training emergencies will be determined with possible recommendations for AF-wide implementation of portions of these approaches to specific training problems.

An instructional systems development approach will be used to apply situational training concepts to an operational USAF aircraft training program. A squadron/aircraft current training program will be studied and a systems analysis of the information flow of emergency procedures data within the target squadron will be accomplished to determine the baseline workload required to sustain the training. A situational program will be created for the aircraft and will replace the existing program. Comparisons in pilot performance under each type of training will be used to assess the value of the situational concept to training emergency responses.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

6.0005, AIRCRAFT MAINTENANCE EFFECTIVENESS SIMULATION (AMES) MODEL

H. Kolkowitz, XYZYX Information Corp., *Canoga Park, California* 91303 (DN894036; N61339-77-D-0028)

To develop a training management/planning tool which will systematically examine the constituent training and human performance variables in aircraft maintenance to predict their effect on maintenance efficiency and cost and aircraft availability.

Design and develop the computer program and data analysis techniques. Test and debug the model through simulation of F-14 and SH-2F aircraft maintenance systems using actual 3M data as input. Develop a model use plan for subsequent efforts.

SUPPORTED BY U.S. Dept. of Defense, Naval Training Equipment Center, Human Factors Lab.

6.0006, NAVY ENVIRONMENT - DYNAMIC RESPONSE OF HUMAN HEAD AND NECK TO IMPACT ACCELERATION

R. Thorpe, Q E I Inc., *119 the Great Rd., Bedford, Massachusetts* 01730 (DN875201; N00014-78-C-0121)

The design of safety devices for pilots of fixed wing and rotary wing aircraft is dependent on our understanding of the response of the human body to extreme acceleration and impact forces. This research will assist in establishing this dynamic response of the human body to acceleration and impact forces.

The principal investigator will reduce and analyze the large amount of data on 3-D head-neck and torso response to impact acceleration that is being collected at the Naval Aerospace Medical Research Laboratory, detachment, New Orleans. Inertial sensor data, physiological data and sled data will be digitized and normalized to standard conditions and analysis performed on this data for application in dynamic response models. The principal investigator will also participate in experimental protocol planning and formation to provide analytical rationale for experimental procedures.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

MATHEMATICAL AND COMPUTER SCIENCES

Includes Mathematical and Computer Sciences (general); Computer Operations and Hardware; Computer Programming and Software; Computer Systems; Cybernetics; Numerical Analysis; Statistics and Probability; Systems Analysis; and Theoretical Mathematics.

7.0001, LSO LABORATORY SOFTWARE

J.T. Hooks, Logicon Inc., *P.O. Box 10179, San Diego, California* 92110 (DN994007; N61339-78-C-0151)

The implementation of a laboratory landing signal officer training system, and generation of data refining prototype LSO training system specification.

Software for speech generation and understanding, visual system hardware, and automated training programs will be implemented and functional requirements supporting the performance specifications of a prototpe LSO trainer will be refined through empirical exercise of the laboratory system.

SUPPORTED BY U.S. Dept. of Defense, Naval Training Equipment Center, Human Factors Lab.

7.0002, HYPERBOLIC PARTIAL DIFFERENTIAL EQUATIONS AND SCATTERING THEORY

J.V. Ralston, University of California, Los Angeles Campus, School of Letters & Science, Dept. of Mathematics, *405 Hilgard Ave., Los Angeles, California* 90024 (MCS7902735)

The investigators will continue the work initiated in MCS-7610227. Their program deals with several topics in partial differential equations. These include: high frequency sound scattering, the asymptotic approximation and numerical computation of waves in elastic solids, the numerical computation of shock waves in gas dynamics, the existence theory for shock waves, the modelling of combustion processes, and the design of software for the numerical solution of boundary value problems.

Renewal of MCS-7610227 A01.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Mathematical & Computer Sciences

7.0003, MOTION DRIVE SIGNALS FOR FLIGHT SIMULATORS - SOFTWARE SERVICES

R.M. Johnson, Appli Mation Inc., *1000 Woodcock Rd., Orlando, Florida* 32803 (DN794043; N61339-77-C-0155)

Provide software services for project 7744, motion drive signals for flight simulators. Support includes programming, documenting of various cockpit motion modules, engineering test modules, graphic plotting program and conversion of Meta symbol basic in-flight maneuver program to FORTRAN.

Modularize program requirements for uniform input/output and machine independence if possible. Code and evaluate various cockpit motion algorithms using standard engineering inputs.

SUPPORTED BY U.S. Dept. of Defense, Naval Training Equipment Center, Experimental Computer Simulation Lab.

7.0004, COMPUTER PROGRAMS FOR FLIGHT VEHICLE SYNTHESIS

H.H. Hilton, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Aeronautical & Astronautical Engineering, *207 Engineering Hall, Urbana, Illinois* 61801

An overall systems concept utilizing an integrated approach incorporating basic aerodynamic, guidance, control, propulsion, and structural principles is being used to develop comprehensive, generalized simulation computer programs for flight vehicle synthesis. The purpose is to develop an educational tool to be used in the teaching of flight vehicle synthesis and optimization. Current capabilities include space vehicle flight programs, airplane missions, various structural programs to determine minimum weight and optimum construction, and printed and teletype graphical output on Calcomp.

Accuracy requirements for computerized synthesis were developed and an examination of estimation errors for two actual airplanes was undertaken by performing computational designs on two existing general aviation computer programs.

In addition, an error analysis was formulated for the determination of aircraft weight estimation accuracy sensitivity to possible errors in aerodynamic, weight and mission performance computerized synthesis analyses. Necessary computational time and implied design costs are also examined in relation to design accuracy in terms of computational iterative tolerances and the number of iterations necessary for achieving prescribed accuracies. A two-step approach was devised with initial large and subsequent fine tolerances, which assures the desired accuracy with substantial decreases in computational time and associated cost.

SUPPORTED BY University of Illinois

7.0005, CHEMICAL-THERMAL TIME-DEPENDENT BEHAVIOR OF INTERSTELLAR CLOUDS

M. Oppenheimer, Smithsonian Institution, Astrophysical Observatory, *60 Garden St., Cambridge, Massachusetts* 02138 (112739-31A)

Develop a computer program capable of solving several complex time-dependent differential equations for the densities of chemical species and the rates of heating and cooling. Results to be presented to the Astrophysical community.

SUPPORTED BY Smithsonian Institution, Astrophysical Observatory

7.0006, MARITIME PATROL AIRSHIP STUDY

J.W. Lancaster, Lancaster Analytics, *Canton, Ohio* (DN981128; N62269-78-M-4426)

Provide techical support to Navy LTA computer sizing and performance programs. In support of work unit No. DH814.

Troubleshoot and rectify computer program irregularities.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate

PHYSICS

Includes Physics (general); Acoustics; Atomic and Molecular Physics; Nuclear and High-energy Physics; Optics; Plasma Physics; Solid-state Physics; Thermodynamics and Statistical Physics. For Related Information See Also Engineering.

8.0001, THERMODYNAMIC AND ELECTRONIC PROPERTIES OF VACANCIES IN HIGH QUALITY CRYSTALS

R.M. Emrick, University of Arizona, School of Liberal Arts, Dept. of Physics, *Tucson, Arizona* 85721 (DMR78-25013)

The fundamental properties of lattice vacancies, which play an important role in the interaction and migration of the metal atoms in crystals, will be studied in high purity gold, palladium and platinum by de Haas-van Alphen techniques. Recent calculations show that a great improvement can be made in the quenching technique used in previous experiments on high purity gold. Considerable information will be gained about the vacancy propeties from new quenching studies, and about the electron scattering properties from de Haas-van Alphen measurements. The extension of the combination of these techniques to platinum and palladium will provide much valuable information about these materials from both the technological and basic scientific point of view.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0002, PLASMA LINE EXPERIMENTS WITH THE CHATANIKA INCOHERENT SCATTER RADAR

V.B. Wickwar, S R I International, Radio Physics Laboratory, *300 Ravenswood Ave., Menlo Park, California* 94025 (ATM78-00129 A01)

This grant funds an extensive series of plasma line experiments with the Chatanika radar. These experiments will extend the successful 'groundbreaking' observations made in January 1976, with emphasis on the auroral E region. However, if conditions permit, observations will also be made in the F region. Furthermore, in addition to measuring the plasma line spectra, the electron density and the electron and ion temperatures will also be measured. Whenever possible, optical measurements (all sky camera, low light-level TV and spectrophotometer) of the auroral emissions will be used. These plasma line experiments provide a ground-based method for examining the low energy suprathermal electron distribution produced by the energetic auroral primaries. They also serve as a way of examining the interaction of these low energy electrons with neutrals. Furthermore, this is done in the energy region 1/2 to 3 eV, -- an exceedingly difficult area to study by any other technique, and consequently, a region that has had minimal exploration. The experiments will be done in collaboration with French Incoherent Scatter Group, who will supply a physicist, an engineer, and a high-speed autocorrelator. For the interpretation of the observations, the collaborative effort with the French as well as the ongoing collaborative efforts with groups modeling the interactions of low-energy electrons, will continue.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

8.0003, THEORETICAL RESEARCH ON LINERS

N. Rostoker, University of California, Irvine Campus, School of Physical Sciences, Dept. of Physics, *Irvine, California* 92664 (DN980182; N00014-75-C-0310)

To perform theoretical studies upon the dynamics of collapsing metallic liners including the rotation of the inside boundary. In addition, theoretical studies aimed at understanding the interaction between contained plasmas and liner surfaces will be studied. The overall objective is to contribute to studies of the feasibility of plasma heating via liner compression.

This program will utilize primarily analytical techniques to study the stability of liner surfaces. Theroetical studies will be undertaken of the reversed-field plasma comfiguration. The program will study specific electron beam configurations where b0

is absent and address the general problem of force-free configurations.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

8.0004, AN EXPERIMENTAL STUDY OF SPIN GLASSES AND DYNAMICS OF SUPERCONDUCTORS
R.L. Orbach, University of California, Los Angeles Campus, School of Letters & Science, Dept. of Physics, *405 Hilgard Ave., Los Angeles, California* 90024 (DMR78-27129)

This research is a continuation and extension of work supported under Grant No. DMR-7682347 and constitutes the experimental part of a comprehensive investigation of the dynamics of magnetic spin glasses and fluctuation effects in superconductors. The spin glass study will concentrate on thin films of noble metal elements doped with manganese (Mn) as the magnetic impurity. The ac magnetic susceptibility of these films will be measured as a function of frequency. These films will also be incorporated into proximity effect sandwiches and the current-voltage characteristics of such structures will be determined. Such data allow one to draw definitive conclusions about the nature of the phase transitions in spin glass systems. Tunneling data for sandwiches with different thicknesses of the spin glass film lead to an absolute measurement of the pair breaking caused by the Mn spins. The spatial and temporal variations of the superconducting order parameter in granular aluminum or aluminum-germanium films doped with erbium as the spin label will be investigated via magnetic resonance and tunneling studies utilizing proximity effect sandwiches. The frequency dependence of the resistance of superconducting-normal-superconducting sandwiches will be used to study nonequilibrium superconductivity with particular emphasis on branch relaxation rates. This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0005, EXPERIMENTAL STUDY OF ANOMALOUS TRANSPORT IN THE LINEAR-CHAIN TRANSITION-METAL-TRICHALCOGENIDES
N.P. Ong, University of Southern California, School of Letters Arts & Sciences, Dept. of Physics, *3551 University Ave., Los Angeles, California* 90007 (DMR79-05418)

There is growing evidence that transport processes (such as electrical conductivity) in lower dimensional systems involve a new mechanism which is different from that known for conventional metals. This mechanism is related to the occurrence of charge density waves (CDW) in these systems. The MX3 compounds - where M is tantalum (Ta) or niobium (Nb) and X is selenium (Se) or sulfur (S) - form linear chains. A variety of instabilities occur in these systems (namely commensurate and incommensurate charge density wave states, and superconductivity). In addition, niobium triselenide (NbSe3) shows strikingly anomalous transport behavior in the charge density wave phase which cannot be explained by single-particle models. Recently, results from the study of effects of dilute impurities in NbSe3 have provided the strongest evidence to date for the Frohlich (sliding mode) conductivity in a metal. It now appears that NbSe3 and its alloys constitute an ideal system in which-current carrying collective modes (associated with the CDW condensate) can be studied conveniently. The work of the present project includes: 1. Further experiments designed to probe the properties of the nonlinear excitations and microwave absorption mode in NbSe3 (high-current galvanomagnetic behavior, ohmic breakdown under hydrostatic pressure, frequency dependence above 10 GHz, current response to nanosecond pulses). 2. A search using microwave measurements of collective modes in the layered compounds.

This is the first year of a two-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0006, ELECTRON CAPTURE BY MOLECULAR IONS IN SINGLE COLLISIONS AT KEV ENERGIES
A. Russek, University of Connecticut, Storrs Campus, School of Liberal Arts & Sciences, Dept. of Physics, *Storrs, Connecticut* 06268 (INT79-05142)

Dr. Arnold Russek of the University of Connecticut is collaborating with Dr. Ignacio Alvarez-Torres, Dr. Carmen Cisneros-Gudino, and other members of the Physics Institute of the University of Mexico. Their research involves a joint theoretical and experimental study of interactions in collisions between molecular ions and atoms which lead to dissociation. The study will focus on energy loss, electron exchange process and angular distributions of dissociation fragments resulting from collisions in the energy range between 250 electron-volts and 700 electron-volts for a variety of collision systems. These systems are of interest in the development of controlled thermonuclear reactors. The study will provide fundamental knowledge of atomic structure for research in chemistry and physics.

Dr. Russek was previously funded by NSF under grant INT76-05772.

SUPPORTED BY U.S. National Science Foundation, Directorate for Scientific Technological & Internat. Affairs, Div. of International Programs

8.0007, A STUDY OF THE HISTORY OF IONOSPHERIC PHYSICS
C.S. Gillmor, Wesleyan University, Graduate School, Dept. of History, *Middletown, Connecticut* 06457 (SOC7602562A02)

Dr. Gillmor is continuing research on the social and intellectual history of ionospheric physics from early developments in the late nineteenth century to the present time. In his research, he has created a large data file concerning ionospheric physics and those working in this field during the last half century. The data will include author, title, and journal information on several thousand ionospheric physics articles published in the period 1920-1960. Further publication and citation data have been prepared for over 2000 ionospheric physics authors for the years 1961, 1971, and for a related sample of individuals for the period 1967-1973. In addition, very extensive mail-survey data have been analyzed (470 persons in 33 countries), along with information gathered during visits to about two dozen laboratories and in approximately 100 oral interviews conducted in Asia, Europe and North America. During the course of this grant, he is undertaking further interviews, archival research and computer analyses on the history of ionospheric physics. Articles and a monograph will result from this research.

SUPPORTED BY U.S. National Science Foundation, Directorate for Biological Behavioral & Social Sciences, Div. of Social & Economic Science

8.0008, COSMIC RAY CASCADES - IMPLICATIONS FOR PARTICLE PHYSICS AND ASTROPHYSICS ABOVE 10 TO THE 15TH POWER EV
T.K. Gaisser, University of Delaware, Graduate School, *Newark, Delaware* 19711 (INT78-17132)

The objective of this U.S.-Bulgarian cooperative project is to develop and apply computer simulation programs to study the collisions of high energy cosmic rays and particle interactions above 10 to the 15th power eV. This knowledge is needed for a better understanding of such phenomena as the collapse of stars which lead to "black holes".

Primary cosmic rays (high energy radiation comprised of electrons and the nuclei of atoms) impinge upon the earth from all directions of outer space with nearly the speed of light. These particles can be studied by observing the showers of secondary cosmic rays produced when the primary rays collide with atomic nuclei in the atmosphere. The high number of electrons resulting from this collision generate extensive air showers of lighter particles that cascade down through the atmosphere to the earth. These showers can be investigated by studying the particles which survive to strike ground level and by observing the flashes of scintillated light that the particles produce in the upper atmosphere.

In this project the U.S. group will perform experimental and theoretical investigations of these showers, while the Bul-

garian group (Dr. Todor Stanev, Institute of Nuclear Research, Sofia) will work on computer simulations of the cascade. Detailed Monte Carlo cascade calculations will be developed to investigate three problems in the interpretation of cosmic ray showers: multiple cores and large transverse momenta; delayed particles in showers; and Cerenkov radiation as a background for scintillation light in large air showers. A basic goal of the study is to determine what the primary cosmic rays are: mostly nuclei of hydrogen, of iron, or other heavy elements.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Scientific Technological & Internat. Affairs, Div. of International Programs

8.0009, EXTREME ULTRAVIOLET ENVIRONMENT

C.S. Weller, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN120101)

The exploration, description, analysis, and understanding of the ultraviolet (uv) environment of the earth and space are quite important since, from a fundamental standpoint, the strong optical effects of atoms and molecules occur in this part of the spectrum. This has in the past and will continue in the future to give new insight and opportunities for investigating solar-terrestrial relationships, establishing the behavior of the upper atmosphere and plasmasphere and their interactions, the interstellar medium and its interaction with the solar system, and developing uv space surveillance.

Observational data acquired from NRL Instruments on space vehicles such as the *STP 72-1, OSO-8,* and *SOLRAD 11* satellites are analyzed and interpreted. New instrument probes are being developed with emphasis on spectral resolution in the extreme uv and imaging in the far uv.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

8.0010, QUANTUM THEORY OF SOLIDS AND MOLECULES

J.R. Sabin, State University System of Florida, University of Florida, School of Arts & Sciences, Dept. of Physics, *208 Tigert Hall, Gainesville, Florida* 32601 (DMR79-09721)

This is a continuation of research previously supported by NSF Grant No. DMR7684577.

This work comprises the extension of previous studies of local exchange models applied to solids and molecules. One aim of this work is to extend those schemes to slabs and clusters in order to understand the chemisorption of small molecules on metal surfaces. A second aim is to modify the present Augmented Plane Wave (APW) code for three-dimensional crystals to take advantage of the flexibility of the Linear Combination of Atomic Orbitals (LCAO) method for other-than-energy quantities. A computer code is under development to convert from a converged APW potential (which can be generated rapidly to an analytic potential, followed by, at most, a few LCAO (Gaussian basis) iterations. An important aspect is the uniform application of a flexible method (LCAO, Gaussian, local exchange) to perfect three-dimensional crystals, slabs, and clusters.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0011, DEVELOPMENT OF AN INSTRUCTIONAL PROGRAM IN APPLIED OPTICS

L.W. Davis, University of Idaho, School of Letters & Science, Dept. of Physics, *Moscow, Idaho* 83843 (SER78-00969)

The goal of the project is to upgrade the Physics Department's instructional effort by developing a program of undergraduate study in the field of applied optics. Project activities will consist of identifying topics which should be emphasized (for example, theory and applications of electro-optic devices) in the course offerings. This will be accomplished by contacting a number of private and federal laboratories that either manufacture or use modern optical components or systems. We also will obtain curriculum improvement suggestions from the Optical Society of America, and talk to faculty at other schools who have experience in this matter. Actual improvement of subject matter dealt with in the existing classical optics course will then be tackled. A suggested plan of study for students wishing to concentrate in applied optics will be worked out. Quality research equipment on hand will be exploited for 'hands on' instructional use. We anticipate that a significant fraction of physics majors will be interested in the applied optics option, as there definitely is a need for graduates exposed to a full curriculum in optics, lasers, associated electronics, etc.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Science Education, Div. of Science Education Resources Improvement

8.0012, THEORY OF ELECTRON CORRELATIONS AT METALLIC DENSITIES AND ITS APPLICATIONS

K.S. Singwi, Northwestern University, Evanston Campus, Graduate School, Dept. of Physics, *633 Clark St., Evanston, Illinois* 60201 (DMR77-09937 A02)

This is a continuation of research previously supported by NSF grant DMR 7619863.

Theoretical investigations of the many-body problem of electron correlations and the dynamical behavior of electrons at metallic densities will be continued. The self-consistent theory which was developed previously will be extended and applied to a number of condensed matter systems including the electron-hole condensate in semiconductors, metallic surfaces and protons or positive muons in metals.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0013, MANY-BODY THEORY AND STATISTICAL MECHANICS OF CONDENSED SYSTEMS

C. Woo, Northwestern University, Evanston Campus, School of Arts & Sciences, Dept. of Physics & Astronomy, *633 Clark St., Evanston, Illinois* 60201 (DMR78-25708)

Research previously supported by DMR7618375. Theoretical research on many-body theory and statistical mechanics of condensed systems will be carried out. This will be focussed on the study of non-uniform systems. A particular thrust will be on solids which are orientationally non-uniform, such as liquid crystals, in which molecular theories will be used to understand the nature of phase transitions in these solids. Also, spatial non-uniformity will be examined in inhomogeneous quantum solids and liquids, in particular surface properties of helium liquids and adsorption phenomena. The last topic deals with several aspects of the correlated-basis-function method, as applied to Fermi systems including liquid helium-3, nuclear matter and Coulomb liquids. This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0014, MAGNETIC IMPURITIES IN SUPERCONDUCTORS

D.M. Ginsberg, University of Illinois, Urbana Champaign Campus, School of Liberal Arts & Sciences, Dept. of Physics, *Urbana, Illinois* 61801 (DMR79-07771)

An investigation of the effect of magnetic impurities (chromium, manganese, iron, cobalt and nickel) on the superconducting properties of several transition metal elements (vanadium, niobium and tantalum) will be initiated. The appropriate dilute alloys will be fabricated via electron-beam coevaporation onto an unheated substrate; the resulting films will be removed from the substrate and characterized by electron microscopy and diffraction as well as mass spectroscopy. Superconducting parameters to be measured include the transition temperature and upper critical magnetic field. Electron tunneling measurements will be used to derive the electron density of states. These data will provide a test of several theoretical concepts and theories regarding the effect of magnetic interactions on the microscopic parameters of the ssperconducting state.

This is the first year of a three-year continuing grant.

This work is an extension of work supported under DMR-7680159.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0015, PROPERTIES OF OXIDES OF VANADIUM IN THE CRYOGENIC TEMPERATURE RANGE
P.H. Keesom, Purdue University, School of Science, Dept. of Physics, *Executive Bldg., West Lafayette, Indiana* 47907 (DMR79-08356)

Incorporation of titanium (Ti) into vanadium sesquioxide, V2O3, leads to dramatic alterations in the temperature, resistivity jump, and enthalpy change associated with a metal-insulator transition which occurs in this material at low temperatures. These alterations are not properly understood. The goals of the present work are to provide information on the mechanism of this transition, and to help determine the role of magnetic exchange interactions in driving the transition. To this end, the resistivity and magnetic susceptibility, discontinuity, the thermoelectric anomaly, and a heat capacity anomaly are studied as a function of Ti doping; Ti acts as a magnetic diluent.

Vanadium oxide forms a series of Magneli type phases, V(n)O(2n-1) (n equals 3, 4, ...8). A wide range of properties occurs. Depending on the O/V ratio, one encounters effects due to low dimensionality associated with a cationic chain, metal-insulator transitions, and magnetic anomalies. It is of great interest to understand why such a wide range of physical phenomena occurs in systems that are so similar chemically and structurally. To this end, high quality single crystals are being grown, and electrical, magnetic, and heat capacity studies are being carried out.

First year of a three year continuing grant; renewal of work supported by DMR76-80551.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0016, EXPERIMENTS ON THE NUCLEON-NUCLEON FORCE, PARTICULARLY PARITY VIOLATION
R. Wilson, Harvard University, Cambridge Campus, School of Arts & Sciences, Dept. of Physics, *Cambridge Station, Cambridge, Massachusetts* 02138 (PHY77-11115 A02)

This grant is a continuation of work previously carried out under PHY77-11115A01. Work will be done on parity violation in nuclear forces. Work will be done at several different laboratories including Grenoble France and the National Bureau of Standards.

Specific experiments include d(n,gamma)t in which the asymmetry of the gamma with respect to the spin of the neutron will be measured. The reactions involving gamma rays are n plus d yields t gamma, 35Cl plus n yields 36Cl plus gamma, 56Fe plus n yields 57Fe plus gamma.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0017, STATE TO STATE DIFFERENTIAL CROSS-SECTIONS
D.E. Pritchard, Massachusetts Inst. of Technology, School of Science, Dept. of Physics, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (CHE7902967)

The research is in the area of quantum chemistry. It deals with the way in which molecules in one particular state react with others. Dr. Pritchard has recently demonstrated a novel technique for measuring angular distributions using the Doppler shift. He plans to apply this technique to the study of energy transfer and chemical reactions in collisions of state-selected diatomic molecules with atoms and with other diatoms. He will study the influence of initial vibration-rotation state and kinetic energy on the differential cross-section for the various product states. It is expected that this advance in specificity will reveal systematic relationships among these variables and that it will also provide highly refined data for comparison with various types of theoretical predictions. This research represents a continuation of that currently supported by Foundation grant CHE7681750.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Chemistry

8.0018, ATMOSPHERIC PHYSICS STUDIES
A. Dalgarno, Smithsonian Institution, Astrophysical Observatory, *60 Garden St., Cambridge, Massachusetts* 02138 (144225-31A)

Computations for quantum mechanical calculations of the transition moments of molecular oxygen.

SUPPORTED BY Smithsonian Institution, Astrophysical Observatory

8.0019, STATIC AND DYNAMIC PROPERTIES OF 4HE, 3HE, 3HE-4HE MIXTURES
R.B. Hallock, University of Massachusetts, Amherst Campus, School of Arts & Sciences, Dept. of Physics, *Amherst, Massachusetts* 01002 (DMR79-09248)

This work is a continuation and extension of work supported under NSF Grants DMR77-07727 and DMR78-07762. A detailed study of superfluid dynamics in helium-4 and helium-3, helium-4 mixtures will be carried out. Areas to be investigated include: (1) the decay of persistent currents in unsaturated helium-4 as a function of helium-3 concentration and substrate pre-plating, (2) the properties of third sound in helium-3, helium-4 mixtures including pulse shape anomalies and measurements of the attenuation, (3) third sound measurements in the vicinity of onset and, (4) studies of the helium-3 surface state on helium-4.

A second investigation will focus on the use of a unique X-ray scattering facility to study the structure factor of helium-3 and helium-4. In particular, the structure factor will be measured at (1) fixed temperature as a function of density, (2) fixed density as a function of temperature, and (3) fixed density in the vicinity of the lambda line. These measurements will be conducted for temperatures in the range of 0.3K to 20K and for pressures up to 30 atmospheres. First year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0020, THEORY OF SOME DISORDERED SYSTEMS
M.F. Thorpe, Michigan State University, Graduate School, Dept. of Physics, *13 Natural Resources Bldg., East Lansing, Michigan* 48824 (DMR79-09170)

Research previously supported by DMR7705983.

This research concerns the theory of disordered systems and involves the development and refinement of some theoretical techniques and their application to real systems. These systems are usually simple and can be adequately described by a Hamiltonian containing only a few parameters.

Some of the topics to be covered are: 1. Some applications of the equation of motion technique and its extension to computations of two magnon spectra. 2. An extension of work on annealed bond Ising models to Potts models and annealed site models. 3. The development of a real-space propagator formalism, for random walk problems with applications to polymers and superionics. 4. The study of the nature of the vibrational and electronic spectra of P2O5 and Si3N4.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0021, SMALL-ANGLE X-RAY SCATTERING STUDIES
P.W. Schmidt, University of Missouri, Columbia Campus, School of Arts & Sciences, Dept. of Physics, *130 Jesse Hall, Columbia, Missouri* 65201 (DMR79-03943)

Small-angle x-ray scattering experiments will be carried out to study the equilibrium properties of argon and nitrogen near the liquid-vapor critical point. Small-angle x-ray scattering is es-

pecially well-suited for these studies in the critical region where many other techniques are difficult or impossible to use. The reduced susceptibility and the long-range correlation length can be calculated from the scattering curves. An especially promising new technique will be used to evaluate the critical exponent which describes the decay of the pair correlation function with distance when the fluid is at the critical point. Techniques will be developed for calculating the particle-dimension distribution from the scattering data for systems of particles with the same shape but different size, and a new method of collimation corrections will be studied.

This research was previously supported by DMR 7514071.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0022, QUANTUM FIELD THEORY WITH DENSITY, TEMPERATURE, AND FIELD PERTURBATIONS

B.J. Harrington, University System of New Hampshire, School of Liberal Arts, Dept. of Physics, *Durham, New Hampshire* 03824 (PHY79-08545)

Research will be done in theoretical physics with a focus on quantum field theory with density, temperature, and field perturbations. Though perturbative contributions to the thermodynamics of a dense quark gas are well understood, very little is known about nonlinear, nonperturbative effects. These latter modes may be of significance at densities found in the interior of neutron stars, in the very early universe, and in heavy ion collisions. Questions that bear on the nature of the ground state of gauge field theories shall be investigated by considering 'color' electric and magnetic field perturbations. In addition, a number of intriguing and, as yet, unanswered questions concerning the peculiar behavior of gauge fields at finite temperature shall be explored. Finally, there will be an approach to higher order effects in perturbation theory that may permit the expansion of current techniques to theories with spontaneous symmetry breakdown.

This work is a continuation of that currently supported under NSF grant PHY77-11521.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0023, AURORAL PLASMA STABILITY

R.L. Kaufmann, University System of New Hampshire, University of New Hamsphire, School of Engineering & Physical Sciences, Dept. of Physics, *Durham, New Hampshire* 03824 (ATM79-05572)

This award will continue a study of linear plasma instability in the auroral ionosphere. The immediate goal of this study is to be able to predict the detailed spectrum of high fequency wave turbulence that is generated by the energetic electrons which are actually measured on rocket flights. Analysis to date has used data from only a small part of one flight. This work will complete an investigation of this flight and permit analysis of data from a second flight that encountered a substantially different electron population. Another payload that is currently being constructed has been specifically designed to measure both energetic electrons and the electrostatic wave structures that have been predicted.

The overall aim is to understand wave phenomena in space plasmas.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

8.0024, THEORY OF DISORDERED SOLID-STATE SYSTEMS

J.M. Luttinger, Columbia University, School of Arts & Sciences, Dept. of Physics, *Broadway & W. 116th St., New York, New York* 10027 (DMR77-06716 A02)

Theoretical studies of disordered solid-state systems previously supported by DMR-7509939 will be continued. A combination of various mathematical methods will be used including path integrals, variational techniques and exactly soluble models. The emphasis of the previous research has been on equilibrium properties such as heat capacity, diamagnetism and phase transitions. The methods will be developed further to include non-equilibrium properties such as electrical conductivity. The latter is of special interest because of its connection to the 'Mott' problem; that is, the transition from localized to non-localized states. Another direction of this research will include the study of collective excitations of disordered systems, particularly in relation to the well-known low-temperature specific heat anomaly in spin-glasses.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0025, THEORY OF SUPERFLUID FERMI LIQUIDS

J. Serene, State University of New York, Stony Brook Campus, School of Arts & Sciences, Dept. of Physics, *Stony Brook, New York* 11790 (DMR7826530)

Theoretical research on the properties of superfluid Fermi liquids will be carried out. In particular, the nature of spatially non-uniform states in a superfluid will be examined, where the structure is substantially modified from its uniform equilibrium form. This occurs, for example, at distances from a boundary which are less than the superfluid coherence length (a few hundred Angstroms in superfluid helium-3). The superfluid state will also be strongly modified near the center of a quantized vortex line, which occurs in rapidly rotating superfluid helium-3B and in the superfluid regions of a rotating neutron star. Both the boundary effects and the structure of vortices will be investigated, paying close attention to related properties of superconducting microbridges and of vortices in type II superconductors.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0026, MOLECULAR MOTION AND NUCLEAR MAGNETIC RELAXATION

P.S. Hubbard, University of North Carolina, Chapel Hill Campus, School of Arts & Sciences, Dept. of Physics & Astronomy, *Chapel Hill, North Carolina* 27514 (DMR79-08671)

Research previously supported by DMR7302626.

Theoretical research on the following topics involving molecular motion and nuclear magnetic relaxation will be carried out: 1. Correlation functions which involve the orientation and angular velocity of molecules in a fluid, and which are important in the theories of nuclear magnetic relaxation and other phenomena, will be calculated by use of the Mori method with truncated cumulant expansions of the memory functions. Evaluation of the correlation functions in terms of specific intermolecular potentials will be attempted. The various correlation functions and correlation times will be compared, and used to determine the relative contributions of different interactions to nuclear magnetic relaxation. 2. The Argyres and Kelley theory of spin relaxation will be applied to situations which cannot be adequately described by the Block-Redfield theories. 3. Nuclear magnetic relaxation of two different kinds of nuclei interacting through scalar interactions and relaxed by various mechanisms will be calculated in order to investigate how the scalar interaction becomes a relaxation mechanism when one kind of nucleus relaxes much more rapidly than the other.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0027, INVESTIGATION OF THE STABILITY OF A NON-NEUTRAL PLASMA COLUMN

C.M. Armstrong, University of North Carolina, North Carolina State University, School of Physical & Mathematical Sciences, Dept. of Physics, *Raleigh, North Carolina* 27607 (PHY78-21575)

A controlled experimental investigation of the stability of a magnetically confined, non-neutral electron plasma with a significant ion component will be initiated. The experimental program will utilize the low current, non-relativistic magnetically

confined electron beam device in the Plasma Physics Laboratory at North Carolina State University. This device can provide a non-neutral electron plasma column which essentially matches the existing theoretical models. This allows an unambiguous comparison between the experimental results and the theoretical predictions. It also provides the ability to selectively control both the plasma state and its environment. Once the instability has been characterized and compared with theory, the various stabilizing mechanisms will be studied.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0028, THEORETICAL AND EXPERIMENTAL STUDIES OF QUADRUPOLAR SPIN GLASS SYSTEMS
D.G. Haase, University of North Carolina, North Carolina State University, School of Physical & Mathematical Sciences, Dept. of Physics, *Raleigh, North Carolina* 27607 (959)

The project objective is a coordinated experimental study of the thermodynamic properties of ortho-parahydrogen mixtures and of closely related theoretical models. The molecular ordering of solid hydrogen, described by electric quandrupole-quadrupole coupling, is a tensor analog of the more usual scalar- and vector-order-parameter spin glasses. The experiments are designed to measure pressure change delta P/delta T and specific heat in the temperature and concentration range believed to correspond to the glass-like phase transition. The theoretical work relies heavily on computer simulation techniques to relate ground-state degeneracy, metastability and anomalous behavior of the measurable thermodynamic parameters. It is hoped that ambiguities with respect to the specific heat can be resolved and that contact can be made with recently published NMR experiments.

Preliminary experiments and computations have been begun within the past month (Jaunary, 1979) and we expect to complete this project by December, 1980.

SUPPORTED BY North Carolina State Government

8.0029, PROPERTIES OF ANISOTROPIC RELAXATION SEMICONDUCTORS
J.F. Schetzina, University of North Carolina, North Carolina State University, School of Physical & Mathematical Sciences, Dept. of Physics, *Raleigh, North Carolina* 27607 (DMR79-11336)

The structural, optical and photoelectric properties of cadmium telluride thin films will be investigated. A two-source deposition technique in an ultra high vacuum chamber will be used to prepare hexagonal-phase CdTe layers. Films will be prepared with the vapor flow normal to the substrate and at an oblique angle of incidence. Preparation of double layer CdTe isojunctions will also be attempted. The structural properties of the layers will be studied using x-ray diffraction and electron microscopy facilities at North Carolina State University and at Oak Ridge National Laboratory. UV-visible-near IR reflectance and transmittance spectroscopy will be used to investigate the optical properties of the film samples. The photoelectric properties of these anisotropic layers will be measured using monochromatic radiation from a laser system in the wavelength range 400-700 nm. Photomagnetoelectric effect experiments will be performed to obtain values for excess carrier transport parameters. The effects of thermal and laser annealing on the structural, optical and photoelectric properties of the layers will also be investigated. The goal of this research is increased understanding of the physics of anisotropic relaxation semiconductors, with hexagonal CdTe serving as a prototype material.

This is a continuation of research initiated under NSF Grant DMR77-08443A01. This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0030, SOLAR NEUTRONS
G.M. Frye, Case Western Reserve University, Graduate School, Dept. of Physics, *2040 Adelbert Rd., Cleveland, Ohio* 44106 (ATM77-24836 A01)

This grant supports a research program for the detection and analysis of the neutron flux emitted during a large solar flare. The EOSCOR (Extended Observation of Solar and Cosmic Radiation) detector has the capability to detect the neutrons from a flare with 1% of the intensity of the August 4, 1972 flare at a balloon altitude of 5 mbar. For the August 4, 1972 flare 25,000 neutrons events would have been detected.

With this grant the original EOSCOR scintillation light collection method will be changed to use adiabetic light pipes which will improve the time of flight (TOF) resolution and pulse height uniformity. The resulting improvement in the knowledge of the proton spectrum in the detector will, in turn, make possible a more precise deduction of the solar neutron energy spectrum. A ten-day flight of the modified EOSCOR detector on a zero-pressure balloon is planned for September, 1979, which will be near the maximum of the present solar cycle. Ultimately the detector will utilize the Sky Anchor zero-pressure/superpressure long duration flight system being developed by NCARR at the National Scientific Balloon Facility (NSBF).

The research is being carried out in collaboration with Professor Victor Hopper's group at the University of Melbourne. The major objective is to observe solar activity by using energetic particles.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

8.0031, COMMUNICATIONS SATELLITE SUPPLEMENT FOR TECHNICAL PHYSICS
E.J. Phillippi, Muskingum Area Technical College, Undergraduate School, *1555 Neward Rd., Zanesville, Ohio* 43701 (SER7900481)

This project will develop an educational supplement to physics courses in Mechanics, Heat and Sound, and Electricity and Light. Experiments in orbital mechanics, heat, wave mechanics, energy transfer and the like will be created and tested. These will be based on telemetry data and Doppler Shift information acquired by direct, real-time communication with an Orbiting Satellite Carrying Amateur Radio (OSCAR 8). Technical college students using relatively inexpensive instruments can readily do the necessary tracking and data collection.

The system provides strong motivation and an array of data around which significant, enriching instructional units can be built.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Science Education, Div. of Science Education Resources Improvement

8.0032, STUDIES IN GENERAL RELATIVITY THEORY
F.P. Esposito, University of Cincinnati, McMicken College of Arts & Sciences, Dept. of Physics, *Van Wormer Adm. Bldg., Room 204, Cincinnati, Ohio* 45221 (INT75-18457 A02)

This award is being given jointly by NSF and the Venezuelan Government to enable Drs. F. Paul Esposito and Louis Witten of the University of Cincinnati to carry on a cooperative research program in 'Studies in General Relativity Theory' with their Venezuelan colleague, Dr. Louis Herrera, of the Universidad Central de Venezuela.

Their studies of the properties of exact solutions of Einstein's General Relativity Equations and of the behavior of perfectly conducting fluids in strong magnetic and gravitational fields are important for the further development of black hole theory and have astrophysical applications in the understanding of stellar collapse.

This award is a renewal of a previous one given to these researchers on the same subject.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Scientific Technological & Internat. Affairs, Div. of International Programs

8.0033, RESEARCH INITIATION - A STUDY OF DEEP LEVELS IN ION-IMPLANTED GALLIUM ARSENIDE

T.K. Plant, Oregon State Higher Education System, Oregon State University, School of Engineering, Dept. of Electrical & Computer Engineering, *200 Covell Hall, Corvallis, Oregon* 97331 (DMR79-08424)

This study is concerned with identifying and electrically characterizing the deep level traps in ion-implanted gallium arsenide (GaAs). Although much data is available on deep levels in bulk-grown or epitaxial GaAs, no work has been done on ion-implanted material. Implants of oxygen, chromium and manganese in high-purity GaAs substrates will be electrically characterized. Hall effect and deep level transient spctroscopy measurements will also be made over the temperature range 4.2 degrees K-300 degrees K. Effects of thermal and laser annealing of the implanted layers will also be studied. Information on the changes in deep level trap concentrations, energy levels and capture cross-sections with annealing should be useful in identifying sources of degradation in ion-implanted GaAs Field Effect Transistors. This will be a University/Industry cooperative research activity undertaken jointly by investigators at Oregon State University and Hughes Research Laboratories.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0034, STUDIES IN NON-LINEAR CONTINUUM PHYSICS

R.S. Rivlin, Lehigh University, Center for the Application of Mathematics, *Alumni Memorial Bldg., Bethlehem, Pennsylvania* 18015 (MCS77-20599 A01)

Continuation of MCS-7406958.

Professor Rivlin will carry on his research program in nonlinear continuum physics with emphasis now on (1) wave propagation in non-linear isotropic and anisotropic materials, (2) electro-optical and magneto-optical effects, and (3) non-Newtonian fluid mechanics.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Mathematical & Computer Sciences

8.0035, NUCLEAR MAGNETIC RESONANCE STUDIES OF THE STRUCTURE OF GLASSES

P.J. Bray, Brown University, Graduate School, Dept. of Physics, *University Hall, Box 1883, Providence, Rhode Island* 02912 (DMR77-08600 A02)

New developments utilizing NMR studies to answer basic scientific questions concerning glass structure will be carried out including the following projects: (1) The O17 NMR spectroscopy of glasses will be used to study oxygen bonding in the alkali borate and silicate systems. (2) Si29 NMR spectroscopy will be completed for glasses and compounds of the system K2O-SiO2 and applied to other alkali and alkaline earth binary silicates and ternary systems. The linewidths and isotropic chemical shifts will also be determined. (3) Newly-developed B10 NMR spectroscopy will be applied to several binary and ternary systems (e.g., Li2O-B2O3 and Na2O-B2O3-SiO2). (4) Recent success in using NMR spectra to determine the structure of glasses in ternary systems will be extended to the systems Na2O-B2O3-SiO2, CdO-TeO2-V2O5, La2O3-B2O3-CdO and K2O-B2O3-P2O5. (5) Ionic motion in glasses will be studied by NMR to determine activation energies, extend present studies of diffusion in systems based on SiO2 and B2O3 to glasses based on other oxides and more novel constituents, and test theories for the mixed-alkali effect.

This is a continuation of research begun under NSF Grant No. DMR76-07814.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0036, PROBLEMS IN RELATIVITY AND PATH INTEGRATION

C. DeWitt Morette, University of Texas, Austin Campus, School of Natural Sciences, Dept. of Astronomy/Physics, *200 W. 21st St., Austin, Texas* 78712 (PHY77-07619 A02)

Research on topics in gravitation theory initiated under NSF grant PHY77-07619A01 will be continued.

DeWitt-Morette and Matzner are both members of the Center for Relativity of the University of Texas. At present, their respective lines of research can be fruitfully brought together to attack the problems of wave propagation and the interaction of radiation with strong gravitational fields. Indeed, from her investigations of path integration, DeWitt-Morette has become an expert on the WKB approximation for a variety of problems, including velocity-dependent potentials, Riemannian configuration spaces, scattering problems, and caustics. On the other hand, Matzner has developed a number of analytic and computational techniques (e.g., exact partial wave summations and computer programs for cross-section calculations) in the study of scattering by Black Holes and in the production of radiation in strong fields. Together they will use for the benefit of wave optics the analogy between: a) wave optics and its approximation classical mechanics, and b) wave mechanics and its approximation classical mechanics which has traditionally been used for the benefit of quantum physics.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Mathematical & Computer Sciences

8.0037, CRYSTAL GROWTH FROM VAPORS

F.E. Rosenberger, Utah Higher Education System, University of Utah, School of Letters & Science, Dept. of Physics, *1400 E. 2nd S., Salt Lake City, Utah* 84112 (DMR79-13183)

This research will be a fundamental study of the transport processes involved in crystal growth from vapors in closed cylindrical geometries. Emphasis will be on how compositional homogeneity and stability of growth depend on the (oscillatory) mass and heat transfer conditions in the vicinity of the solid-vapor interface. Supplementary theoretical (numerical) and experimental studies will determine transport (i.e. growth) rates in Physical and Chemical Vapor Transport systems as a function of ampoule geometry, orientation with reference to the gravity vector, temperature distribution and filling conditions.

Laser Doppler anemometry and differential interferometry will be used for vapor velocity measurements and flow visualization. Vapors and materials employed will be chemically characterized by matrix isolation, infrared and Raman spectroscopy, mass spectroscopy and atomic absorption spectroscopy. Transport rates will be studied by in-situ weighing with and electromicrobalance.

This is a continuation of research initiated under NSF Grant DMR75-03175-A01, and the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0038, ELECTRONIC PROPERTIES OF METALS AND ALLOYS IN HIGH MAGNETIC FIELDS

R.V. Coleman, University of Virginia, School of Arts & Sciences, Dept. of Physics, *Garrett Hall, Charlottesville, Virginia* 22903 (DMR78-02553)

The electronic structure and properties of layer crystals exhibiting charge density wave (CDW) transitions will be investigated experimentally. Measurements of quantum oscillatory phenomena at high magnetic fields will be made on single crystals of layer structure dichalcogenides and trichalcogenides. DC transport measurements including Hall effect, magnetoresistance and superconducting anisotropy will also be carried out. Both Shubnikov de Haas and de Haas van Alphen oscillations will be measured using AC modulation and harmonic detection. These techniques are being extended for use on the high field Bitter solenoids at the National Magnet Laboratory. Charge density wave formation in the chalcogenides will be studied and the effects of organic intercalation and pressure on the CDW will be

followed by measuring the quantum oscillatory phenomena. DC susceptibility, Hall effect and magnetoresistance as a function of temperature will also be used to correlate results with CDW formation.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0039, U.S.-U.S.S.R. COLLABORATION IN FUNDAMENTAL PHYSICS

L. Brown, University of Washington, School of Arts & Sciences, Dept. of Physics, *Seattle, Washington* 98105 (PHY7906533)

This grant covers the immediate local costs of a six-week visit by two Soviet physicists, Dr. I.B. Khriplovich and L.M. Barkov, both Senior Scientists at the Institute of Nuclear Physics, Academy of Sciences, Siberian Division, Novosibirsk, USSR, to the University of Washington.

Dr. Barkov heads a world-famous atomic parity-violation experiment and Dr. Khriplovich has contributed greatly to the theoretical basis of this experiment. Their work is closely related to work of University of Washington physicists and their visit should help resolve presently existing experimental and theoretical discrepancies.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

SPACE SCIENCES

Includes Space Sciences (general); Astronomy; Astrophysics; Lunar and Planetary Exploration; Solar Physics; and Space Radiation. For Related Information See Also Geosciences.

10.0001, SEARCH FOR OTHER PLANETARY SYSTEMS IN THE UNIVERSE

K.M. Serkowski, University of Arizona, Lunar & Planetary Lab., *Tucson, Arizona* 85721

The radial velocity meter, invented by the applicant, has been in operation on the 154-cm telescope since July 1977. The instrument is used for searching for planets similar to Jupiter around stars similar to the Sun. If such planets have orbital periods as short as several weeks or months they may be detected during the next year. Detection of extrasolar planets would provide an impetus for intensifying a search for signals from civilizations on such planets. Also, it would be a great step towards explaining the origin of planetary systems.

In our radial velocity spectrometer the wavelength calibration for measuring Doppler shifts in stellar spectra is provided by a tiltable Fabry-Perot etalon, kept in vacuum at constant temperature. The stellar brightness at the etalon's transmission maxima, separated by our echelle spectrograph, is measured by a solid-state television camera attached to an image intensifier. This camera, which is being installed presently, replaces the previously used Digicon image tube which was losing its sensitivity.

The requested support is essential for continuation of the project.

SUPPORTED BY National Geographic Society

10.0002, EXPERIMENTAL RELATIVITY BY DAYTIME ASTROMETRY AT SCLERA

H.A. Hill, University of Arizona, School of Liberal Arts, Dept. of Physics, *Tucson, Arizona* 85721 (AST79-08558)

SCLERA is a daytime astrometric installation with research emphasis on experimental and solar physics. The basic effort in the experimental relativity program is the observation of anomalous effects in the positions of planets near conjunction. That observation relies on the Sun's diameter for a reference length unmarred by the effects of the Earth's atmosphere or the instrument. The capacity to measure a diameter of the sun to the requisite accuracy for the experimental relativity program makes available a powerful tool for studying the sun. The primary concerns here have been the measurement of the solar oblateness, which is of considerable importance in experimental relativity, and the development of a solar seismology program for utilizing the low-order normal modes of oscillation as well as the well known five-minute oscillation.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Astronomical Sciences

10.0003, THEORETICAL ASTROPHYSICS

C. McKee, University of California, Berkeley Campus, School of Letters & Science, Dept. of Astronomy, *Berkeley, California* 94720 (AST77-23069 A01)

A number of topics in stellar, interstellar, and extragalactic astrophysics will be studied. In anticipation of forthcoming satellite observations, predictions will be made of the expected phenomena related to neutron stars which seem to be at the center of many x-ray sources. The answer to the outstanding question of how pulsars convert their spin energy into the peculiar radio emissions observed will be sought. The dynamics of an individual collapsing star and the questions of how gas clouds break up into proto-stellar fragments will be studied. A variety of calculations of interstellar chemistry will be pursued, with the aim of relating observations of interstellar molecules to the physical conditions (temperature, density) of the gas in which the the molecules exist. An interrelated group of studies of the Crab Nebula, compact variable radio sources in quasars and active galactic nuclei, and other quasar phenomena will be pursued in the hopes of increasing our understanding of these enigmatic objects. The problem of star formation will be one of the research areas covered in the first year.

This is a continuation of research under grant AST-7723069.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Astronomical Sciences

10.0004, STELLAR ASTROPHYSICS

F.H. Shu, University of California, Berkeley Campus, School of Letters & Science, Dept. of Astronomy, *Berkeley, California* 94720 (AST78-27594)

The research topics to be investigated involve important unresolved issues of mass and energy flow in stellar objects which are currently of great interest. Specific plans involve the following areas: A. Previous work on mass transfer in semi-detached binary stars will be extended to include the effects of non-synchronous spin of the mass-losing star, and to consider the structural response of the mass-receiving star after it has come into contact with its companion. B. The contact discontinuity model of the structure of contact binaries will be used to begin a study of their evolution on nuclear timescales. It is proposed to derive the shapes of W Ursae Majoris stars from an observational program of high resolution spectroscopy. C. Continuing theoretical work on protostellar evolution will be carried to a successful completion. Then an effort will be begun to calculate the observable consequences which can be compared with the many ongoing observational projects on young stars being carried out, including the active program at Berkeley under the direction of Leonard V. Kuhi.

In addition to these definite plans, new leads which appear during the course of the investigations will be pursued if they appear especially promising.

Prior support was by NSF grant AST 77-21643A01.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Astronomical Sciences

10.0005, A THEORETICAL INVESTIGATION OF THE COMPOSITION AND STRUCTURE OF COMETS

D.A. Mendis, University of California, San Diego Campus, Graduate School, Dept. of Applied Physics & Information Science, *P.O. Box 109, La Jolla, California* 92037 (AST78-19008)

Comets are considered to be the most primitive and least evolved members of the solar system in many respects. Research on these objects thus bears on the origin and evolution of

the solar system. In this project, information of use to researchers in the interstellar medium should also be obtained. The aim of this project is to investigate theoretically the structure and composition of comets. The five principal areas to be studied are: 1. The physical and dynamical processes in the gases surrounding the comet, its atmosphere, ionosphere, and tail; 2. The interactions between comets and the solar wind; 3. The formation and shapes of cometary magnetic fields and the associated currents and plasma flow; 4. Physical properties of the nucleus and dust component, including their probable chemical compositions; 5. The interactions between cometary dust and plasma, particulary in the dust tails associated with some comets.

Prior support was by NSF grant AST 77-19879.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0006, PULSATING MAGNETOSPHERES

D.F. Smith, University of Colorado, Boulder Campus, Graduate School, Dept. of AstroGeophysics, *1200 University Ave., Boulder, Colorado* 80302 (AST78-19496)

An investigation of the recurrent pattern of emission of radiation in pulsars will be undertaken. The current flow pattern in oblique rotator non-neutral beam models of pulsar polar caps will be studied including the possibility of return currents everywhere in the caps for periods too slow for pair creation to occur. Such models favor radiation mechanisms since the particle energy density becomes comparable to the magnetic field energy density close to the pulsar light cylinder. The closed magnetosphere will be assumed force-free except for a thin boundary layer inside its boundary with the polar caps. The properties of this boundary layer will be self-consistently derived.

The goal is to construct a self-consistent particle flow pattern in a non-neutral pulsar polar cap and investigate its stability properties. This research could lead to an explanation of observed phase coherence in the pulsar subpulses over many rotation periods and a bunching mechanism for particles strong enough to explain the observed radiation. The results will also be applicable to rapidly rotating magnetic white dwarfs.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0007, THEORY OF PLASMA WAVES, ELECTRON STREAMS, AND RADIO-WAVE EMISSION DURING TYPE III SOLAR RADIO BURSTS

M.V. Goldman, University of Colorado, Boulder Campus, School of Arts & Sciences, Dept. of Astro Geophysics, *1200 University Ave., Boulder, Colorado* 80302 (ATM79-16837)

This award will extend for one final year National Science Foundation grant ATM76-14275, which has covered the three-year period August 1, 1976 through August 1, 1979. The research has been concerned with the theory of Type III solar radio wave emission. As a result of computer and analytical work, it has been found that the Langmuir wave packets excited by the electron streams can undergo self-focusing, or collapse, to small spatial scales. During the dynamical phase of collapse the packets radiate like antennae. The radiation is mainly at the first harmonic of the plasma frequency and is quadrapole in nature. It has been demonstrated that certain models of collapse are consistent with observations. The present work is for one final year of research on Type III bursts, to complete present Langmuir wave packets, including magnetic effects, wave-particle interactions, and break-up and recurrence of wave packets; and also to enable interaction between theory and incipient laboratory experiments.

The overall aim is to understand Type III radio emissions from the sun.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

10.0008, INVESTIGATION OF STRATOSPHERIC IONS WITH BALLOON-BORNE MASS FILTER AND CONDUCTIVITY PROBES

R.C. Amme, University of Denver, School of Arts & Sciences, Dept. of Physics & Astronomy, *2115 S. University Blvd., Denver, Colorado* 80210 (ATM79-02594)

A two-year investigation of the relative abundances and masses of stratospheric ions and of the electrical conductivity resulting from their presence will be conducted. A mass filter package previously constructed under an Army Research Office grant will be flown on three balloon flights, two of which will involve a search for negative ions. Two flights will reach the 33-35 km altitude, while the third will reach 40-42 km. Sunrise effects on ion composition will be studied and altitude profiles of ion concentration will be obtained. The results will provide knowledge of the consequences of galactic and solar particulate radiation on the stratosphere and key data needed to improve understanding of atmospheric ion chemistry.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

10.0009, SPECTROSCOPIC STUDY OF GALAXIES ASSOCIATED WITH QUASI-STELLAR OBJECTS

A.N. Stockton, University of Hawaii System, Manoa Campus, Inst. for Astronomy, Dept. of Astronomy, *2840 Kolowalu St., Honolulu, Hawaii* 96822 (AST78-21946)

Two fundamental questions motivate virtually all research on quasi-stellar objects (QSOs): (1) what is the ultimate nature of the energy source in these objects? and (2) how are they related to normal galaxies? To a certain extent these questions are correlated, in that if we were able to give a full and detailed answer to one of them, we surely would have some strong clues as to the answer to the other. Until recently, attempts to answer these questions have had to depend exclusively on observations of the QSOs themselves; the research to be carried out will seek to deal particularly with the second question through observations of the local environment of low-redshift QSOs. It has long been evident that QSOs are not frequently associated with rich clusters of galaxies and research has shown that bright QSOs are often associated with small groups of galaxies. It is possible and even likely that most QSOs have normal galaxy companions. It is unlikely that much more of scientific value would be achieved by ferreting out additional examples of low-redshift QSOs with associated galaxies at this stage. The extension of this work will seem to lie in the direction of (1) detailed, systematic studies of three or four of the associations already found, and (2) a deep photographic survey of a sample of QSOs in a somewhat higher redshift range.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0010, RADIAL VELOCITIES OF G AND K GIANTS LYING MORE THAN 500 PARSECS ABOVE THE GALACTIC PLANE

K.M. Yoss, University of Illinois, Urbana Champaign Campus, School of Liberal Arts & Sciences, Dept. of Astronomy, *Urbana, Illinois* 61801 (AST78-08621)

Stars classified as G and K giants which lie 500 parsecs or more from the galactic plane and are within 7 degrees of both galactic poles will be identified by David Dunlop Observatory photometry standards, thereby significantly increasing the present sample.

Spectrograms will be obtained of these stars far out of the plane of the galaxy in order to measure radial velocities. These results in turn will let us determine the perpendicular velocity dispersion as a function of height from the plane and composition. The perpendicular galactic force K(z) can then be established with greater certainty than is presently the case.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0011, PARTICLES AND CURRENTS IN THE GEOMAGNETIC FIELD

D.B. Beard, University of Kansas, Lawrence Campus, School of Liberal Arts & Sciences, Dept. of Physics & Astronomy, *112 Bailey Hall, Lawrence, Kansas* 66045 (ATM76-23448 A02)

This grant continues a study of planetary magnetospheres with emphasis on magnetotail sources of current and structure. Improved tail field predictions will be used in reanalyzing magnetic measurements of Mercury's magnetic field as a test of the improvement in theory. Further improvement of addition of time-dependence into present magnetopause and tail field expressions will permit a continuation of global electric fields throughout the magnetosphere during magnetic storms. Calculation of fields throughout the magnetosphere with a view to predicting the penetration rate of magnetosheath plasma through the magnetopause will be continued. Collaboration with colleagues at Imperial College in examining boundary electrical resistivity effects on currents, magnetic fields, and electric fields will continue. The calculation of the shape of the Jovian magnetosphere will be finished.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

10.0012, ROCKET INVESTIGATION OF ELECTRON PRECIPITATION TRIGGERED BY VLF EMISSIONS

D.L. Matthew, University of Maryland, College Park Campus, Inst. for Physical Science & Technology, *College Park, Maryland* 20742 (DPP77-22401 A01)

This proposal is a continuation of grant number DPP77-22401.

In this NSF and NASA jointly-sponsored project, three Nike-Tomahawk rockets will be instrumented with electron spectrometers to study the plasma physics of wave-particle interactions in the earth's magnetosphere. These rockets will be launched from Siple Station, Antarctica, during the austral summer of 1979-80 in conjunction with balloons, satellites, ground-based, and other rocket observations of wave-particle interactions.

There will be three University of Maryland scientists under this grant at Siple Station during the 1979-80 field season.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Polar Programs

10.0013, OPTICAL STUDIES OF HIGH ENERGETIC ASTRONOMICAL SOURCES

W. Liller, Harvard University, Cambridge Campus, School of Arts & Sciences, Dept. of Astronomy, *Cambridge Station, Cambridge, Massachusetts* 02138 (AST78-23814)

Investigations of highly energetic astronomical sources will be continued using: (a) the all-sky photographs in the Harvard Collection, and (b) the various accessories and telescopes of the National facilities, especially Cerro Tololo Interamerican Observatory and instruments of other observatories. The emphasis in (a) will be on historical light curves of recently unidentified quasi-steller objects, x-ray source counterparts, and cataclysmic variables; in (b) we will concentrate on the identification and study of x-ray source counterparts, especially 'bursters', globular clusters, and extra-galactic systems.

This is a continuation of AST-7600527AO2.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0014, RESEARCH IN GALACTIC AND EXTRAGALACTIC ASTROPHYSICS

N.A. Bahcall, Princeton University, School of Natural Sciences, Dept. of Astrophysical Sciences, *Box 430, Princeton, New Jersey* 08540 (AST79-06328)

The following research projects will be carried out: 1) Optical properties of clusters and superclusters of galaxies, from nearby to distant sources (z less than 0.5 and greater than 0.02). The study will correlate optical properties with other important cluster parameters. The measured properties will include structure, classification, density distributions, core radii, central densities, mass segregation, and galactic content of the clusters and superclusters. 2) Optical identification and studies of newly discovered x-ray sources, including: a) unidentified high galactic latitude sources; b) rich clusters of galaxies; c) isolated galaxies and QSOs; d) globular star clusters.

The first study is necessary for the understanding of the dynamics, formation, and evolution of clusters and superclusters of galaxies, which are the largest observed systems in the universe. It is also an important step in some cosmological applications and a necessary background investigation for planning future observations with the Space Telescope planned to be launched in 1983. The second study is important in determining the nature of new sources that are being discovered with X-ray satellites.

This is a continuation of AST-7615386A01.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0015, STUDIES IN STELLAR ASTRONOMY

L.B. Lucy, Columbia University, School of Arts & Sciences, Dept. of Astronomy, *Broadway & W. 116th St., New York, New York* 10027 (AST79-13179)

The research to be carried out under this grant will be concerned with studies of the physics of binary stars: 1) There will be a study of binary star formation - this will involve the use of computer codes capable of handling three-dimensional gas dynamics problems. 2) There will be an analysis of data on binary stars - this analysis will be aimed at obtaining further information on the physical mechanisms which lead to the formation of close binary stars. 3) An analysis will be made of the current theories of very close (contact) binary systems.

In addition to the studies of binary stars, single stars will also be studied. In particular there will be: 1) an investigation of the pulsation properties of models of A-type supergiant stars; 2) an investigation aimed at providing self-consistent models of dust-shrouded carbon stars; and 3) an investigation of models of stars showing unusual abundances of helium.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0016, HYDRODYNAMICAL INVESTIGATIONS OF GAS FLOW IN THE CENTRAL REGIONS OF SPIRAL GALAXIES

K.H. Prendergast, Columbia University, School of Arts & Sciences, Dept. of Astronomy, *Broadway & W. 116th St., New York, New York* 10027 (AST78-26959)

Theoretical investigations of the nature of gas kinematics in the central regions of spiral galaxies will be carried out. The purpose of this research is to assess the relative importance of explosive vs. non-explosive origins for non-circular motions in the central regions of normal spiral galaxies. This problem is related to the question of the generality of explosive phenomenon in galactic nuclei; i.e., is explosive release of energy a normal consequence of the evolution of galactic nuclei? This research centers on numerical hydrodynamical calculations of gas response both to point explosions in gaseous disks (explosive hypothesis) and to weakly non-axisymmetric gravitational fields (non-explosive hypothesis). The machine codes for carrying out these hydronumerical calculations have been written and tested on a number of problems. These codes will be used to generate grids of realistic physical models for detailed comparison with observations of gas kinematics in both external spiral galaxies and our own Galactic Center region. In particular, comparison of theoretical models with observations of the Galactic center

will make use of high resolution carbon monoxide and neutral hydrogen surveys.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0017, THEORETICAL SOLAR SYSTEM STUDIES
T. Gold, Cornell University, Ithaca Campus, Center for Radiophysics & Space Research, Dept. of Applied Physics, *Ithaca, New York* 14850 (AST79-16474)

Support is for research to be carried out at the Cornell Center for Radiophysics and Space Research in the field of solar system dynamics and evolution. The plans for the immediate future include further studies of the ring system of Uranus, studies of the dynamical implications of the neumerous new results of the Voyager mission, including the ring of Jupiter and the shapes of the satellites. In addition studies will be undertaken of other evolutionary effects for which the basic information is now at hand, and through which a more complete understanding of the solar system can be obtained.

Prior support was under NSF grant AST 78-09431.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0018, RARE GASES IN RETURNED LUNAR MATERIALS
O.A. Schaeffer, State University of New York, Stony Brook Campus, School of Arts & Sciences, Dept. of Earth & Space Science, *Stony Brook, New York* 11790 (EAR79-06956)

This is a continuing study which had previously been supported by NASA but transferred to the NSF for support.

The study will continue K-Ar chronological studies of lunar materials by the 39Ar - 40Ar thermal release and laser probe methods. The long-term goal is to obtain a reliable chronology for the moon which will hopefully also yield information about the intense early cratering of the inner planets in the solar system.

Work will continue in the areas of: (1) further evaluating the laser technique, (2) continuing a laser probe study of Apollo 17 highland breccias so as to ascertain whether Apollo 17 highland breccias are cogenetic or not, (3) continue our search for ancient lunar material in 65015, (4) making a laser study of 73255 to unravel its complex chronology, and (5) make thermal release studies to support the laser work.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Earth Sciences

10.0019, VLA STUDIES OF THE SOLAR CHROMOSPHERE AND TRANSITION REGION
M. Simon, State University of New York, Stony Brook Campus, School of Arts & Sciences, Dept. of Earth & Space Sciences, *Stony Brook, New York* 11790 (ATM79-17608)

With the support provided here very high angular resolution radio observations, using the Very Large Array (VLA) of the National Radio Astronomy Observatory (NRAO), of the fine structure of the solar chromosphere and transition region will be performed. These observations will provide a direct measurement of the physical conditions in the fine structure and thus lead to the construction of atmospheric models that explicitly include these inhomogeneities. These observations will enable an assessment of the role that features such as spicules play in the solar atmosphere and hence contribute to an understanding of the energy balance and heating mechanisms in the chromosphere and transition region. In turn, this will improve our understanding of the way in which solar energy drives the solar atmosphere out beyond the orbit of the earth.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

10.0020, THE ATMOSPHERES OF VERY LUMINOUS STARS - OBSERVATION AND THEORY
N.D. Morrison, University of Toledo, School of Arts & Sciences, Dept. of Physics & Astronomy, *2801 W. Bancroft St., Toledo, Ohio* 43606 (AST78-27620)

This project will be concerned with a study of supergiant stars of spectral types A and F. Its objectives are to improve our current knowledge of the effective temperatures and surface gravities of such stars, to determine their mass-loss rates, and to understand the peculiarities of certain stars that appear to mimic supergiants. High-resolution visible and ultraviolet spectroscopic data and low-resolution photoelectric spectrophotometric data will be obtained and will be fitted to theoretical models of the atmospheres of these stars.

The evolution of massive stars is influenced by the mass-loss that takes place in these objects. The mechanism that causes this loss is poorly understood, and the research to be carried out will provide a check on current theories. Much of the mass of a massive star returns to the interstellar medium and enriches it with heavy elements. The stellar winds from massive stars may compress nearby compact interstellar clouds and trigger star formation. The study of stellar winds in massive stars will contribute to understanding both star formation and the chemical history of the galaxy.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0021, CLIMATIC VARIATIONS CAUSED BY THE INTERACTION OF THE SOLAR SYSTEM WITH DENSE INTERSTELLAR CLOUDS
R.J. Talbot, Rice University, Graduate School, Dept. of Space Physics & Astronomy, *6100 Main St., Houston, Texas* 77001 (ATM78-26776)

This award is for a study of processes which are predicted to have been an important influence upon the Earth in the past. Although having no immediate influence upon climate during our lifetime, the scientific understanding of the processes is necessary in order to fully decipher the mechanisms governing the climate system.

Effects upon Solar System objects (especially the Earth and the Sun) during its passage through dense interstellar clouds will be studied. Preliminary investigations have shown that several effects should have influenced the Earth during episodes numbering anywhere between approximately 10 (severe episodes) to approximately 10 to the 3rd power (very mild episodes). Topics predicted to be important and which will be studied are: (a) Influence of planetary atmospheres being exposed to cold interstellar material rather than the solar wind, (b) effects of interstellar dust within the Solar System and (c) the past strength of the solar luminosity and solar wind and the reversal of the solar wind into an accretion flow.

The overall aim is to understand the solar/terrestrial system and its interaction with the interstellar medium.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

10.0022, EXTRAGALACTIC CHEMICAL ABUNDANCES
G.A. Shields, University of Texas, Austin Campus, School of Natural Sciences, Dept. of Astronomy, *200 W. 21st St., Austin, Texas* 78712 (AST78-04575)

Chemical abundances in extragalactic objects are important clues to the evolution of normal and active galaxies. The research will mainly involve a study of the physical conditions and abundances in ionized nebulae in external galaxies and quasars. In the area of composite gradients across spiral galaxies, the observed line intensities of H II regions will be analyzed with detailed models including the effects of density fluctuations, internal dust, and metal absoption edges in the stellar atmospheres. Goals of the work include more accurate determination of the gradients in metal and helium abundances across H101 and of the dependence of the composition gradient on morphological type, and an understanding of the gradients in

terms of galactic evolution. For Seyfert galaxies and QSOs, models involving time-dependent ionization will be used in an effort to determine the O/H, N/O, and N/C abundances ratios, and to clarify the ionization mechanisms. Similar techniques will be used to study physical conditions and abundances in several Galactic nebulae. The research will be primarily theoretical, supplemented with new data obtained in collaboration with several observers.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0023, PLANETARIUM STAR PROGRAM ON RELATIVITY AND ASTRONOMY

M. Littmann, Hansen Planetarium, *15 S. State St., Salt Lake City, Utah* 84111 (OSS78-24354 A01)

This grant supplements an award to the Hansen Planetarium to produce and distribute a planetarium program on Einstein's contributions to astronomy on the occasion of the one hundreth anniversary of his birth. The demand for the packages has exceeded original expectations and these funds will permit the production and distribution of additional packages.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Science Education, Office
of Science & Society

10.0024, SOLAR CORONAL ROTATION AND RECURRENT PHENOMENA IN INTERPLANETARY SPACE

G.D. Parker, Norwich University, Undergraduate School, Dept. of Physics, *Northfield, Vermont* 05663 (ATM79-11109)

During solar cycle 19, the discovery and first in situ observations of the solar wind opened a new chapter in solar-terrestrial physics. Following these pioneering investigations, a variety of spacecraft experiments were performed throughout solar cycle 20 and now provide a comprehensive view of solar wind variability. With these data and contemporaneous observations of the optical Sun, it is appropriate to inquire about the source of the solar wind which reaches the vicinity of the Earth.

Aiding this inquiry is the happy circumstance that the Sun rotates differentially. Solar wind plasma speed, the interplanetary magnetic field, and the galactic cosmic ray intensity near the Earth all show significant variability on the time scale of a solar rotation period. Because solar rotation is differential, space phenomena linked to solar rotation may be characterized by time scales indicative of the 'responsible' solar latitude. A requirement for deriving solar source latitudes for recurrent and corotating phenomena near the Earth is the determination of solar differential rotation at heights in the corona where the solar wind emanates. The research supported here seeks to establish the height, latitude, and time dependence of the rotation of the solar electron corona through analyses of K-coronameter data collected by the High Altitude Observatory during solar cycle 20. Coronal differential rotation will be compared with the temporal behavior of recurring space phenomena for evidence regarding latitudinal motions of the solar wind reaching the vicinity of the Earth.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

10.0025, INFRARED AND OPTICAL OBSERVATIONS OF QUASI-STELLAR OBJECTS

G.L. Grasdalen, University of Wyoming, Graduate School, *P.O. Box 3435, University Station, Laramie, Wyoming* 82070 (AST78-17189 A01)

This project will involve a survey of infrared and optical photometry of quasi-stellar objects using the recently completed 2.3 meter telescope of the University of Wyoming. A primary goal of this program will be an examination of the continuum properties of the spectrum of these objects. A second aspect of the research will be to observe the near infrared emission-line spectrum of several quasi-stellar objects. The comparison of infrared and optical line strengths will provide strong constraints on the physical conditions, especially the density, in the outer parts of these objects.

This is a continuation of AST-7817189.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

VOLUME 18 NUMBER 10/MAY 23, 1980

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N80-19021* National Aeronautics and Space Administration, Washington, D. C.

AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 119)

Feb. 1980 111 p

(NASA-SP-7037(119)) Avail: NTIS HC $5.00 CSCL 01A

This bibliography lists 341 reports, articles, and other documents introduced into the NASA scientific and technical information system in January 1980. Abstracts on the engineering and theoretical aspects of design, construction, evaluation, testing, operation, and performance of aircraft (including aircraft engines) and associated components, equipment, and systems are presented. Research and development in aerodynamics, aeronautics, and ground support equipment for aeronautical vehicles are also presented. A.W.H.

N80-19022*# National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.

ANALYSIS OF FUEL-CONSERVATIVE CURVED DECELERATING APPROACH TRAJECTORIES FOR POWERED-LIFT AND CTOL JET AIRCRAFT

Frank Neuman Apr. 1980 38 p refs

(NASA-TP-1650; A-7986) Avail: NTIS HC A03/MF A01 CSCL 02A

A method for determining fuel conservative terminal approaches that include changes in altitude, speed, and heading are described. Three different guidance system concepts for STOL aircraft were evaluated in flight: (1) a fixed trajectory system; (2) a system that included a fixed path and a real time synthesized capture flight path; and (3) a trajectory synthesizing system. Simulation results for the augmentor wing jet STOL research aircraft and for the Boeing 727 aircraft are discussed. The results indicate that for minimum fuel consumption, two guidance deceleration segments are required. A.W.H.

N80-19023*# National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.

AEROACOUSTIC WIND-TUNNEL TESTS OF A LIGHT TWIN-BOOM GENERAL-AVIATION AIRPLANE WITH FREE OR SHROUDED-PUSHER PROPELLERS

H. Clyde McLemore and Robert J. Pegg Apr. 1980 88 p refs

(NASA-TM-80203; L-13371) Avail: NTIS HC A05/MF A01 CSCL 01B

Tests were conducted in the Langley full-scale tunnel to determine the aerodynamic performance and acoustic characteristics of four different pusher-propeller configurations on a twin boom, general aviation airplane. The propellers included a 2-blade free propeller, two 3-blade shrouded propellers, and a 5-blade shrouded propeller. The tests were conducted for a range of airplane angles of attack from about 0 deg to 16 deg for test speeds from 0 to about 36 m/sec and for a range of propeller blade angles and rotation speeds. The free propeller provided the best aerodynamic propulsive performance. For forward flight conditions, the free propeller noise levels were lower than those of the shrouded propellers. In the static conditions the free propeller noise levels were as low as those for the shrouded propellers, except for the propeller in-plane noise where the shrouded propeller noise levels were lower. J.M.S.

N80-19024*# National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.

MILITARY AIRCRAFT AND MISSILE TECHNOLOGY AT THE LANGLEY RESEARCH CENTER: A SELECTED BIBLIOGRAPHY

Dal V. Maddalon Jan. 1980 43 p

(NASA-TM-80204) Avail: NTIS HC A03/MF A01 CSCL 02A

A compilation of reference material is presented on the Langley Research Center's efforts in developing advanced military aircraft and missile technology over the past twenty years. Reference material includes research made in aerodynamics, performance, stability, control, stall-spin, propulsion integration, flutter, materials, and structures. Author

N80-19025*# National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.

WORKSHOP ON AIRCRAFT SURFACE REPRESENTATION FOR AERODYNAMIC COMPUTATION

T. J. Gregory, ed. and John Ashbaugh, ed. Feb. 1980 560 p Workshop held at Ames Research Center, Moffett Field, Calif., 1-2 Mar. 1978

(NASA-TM-81170; A-8075) Avail: NTIS HC A24/MF A01 CSCL 02A

Papers and discussions on surface representation and its integration with aerodynamics, computers, graphics, wind tunnel model fabrication, and flow field grid generation are presented. Surface definition is emphasized. R.E.S.

N80-19026*# Michigan Univ., Ann Arbor.

TRAJECTORIES OPTIMIZATION IN HYPERSONIC FLIGHT Final Report

Nguyen X. Vinh Mar. 1980 5 p refs

(Grant NsG-1448)

(NASA-CR-162846) Avail: NTIS HC A02/MF A01 CSCL 02A

Equations of motion were derived for the three dimensional flight of a lifting vehicles, taking into consideration all the main effects of different forces acting on a vehicle at orbital speeds. A set of equations was formulated which are valid for both the flight with lift modulation inside a planetary atmosphere and the Keplerian motion in the vacuum. The equations are independent of the physical characteristics of the vehicle. The only parameters involved are the maximum lift to drag ratio of the vehicle and a constant characterizing the atmosphere. The results obtained can be applied without modifications to any future reentry vehicle, regardless of its size, shape, and mass. A.R.H.

N80-19027*# RAND Corp., Santa Monica, Calif.

ESTIMATING THE TIME REQUIRED TO TRANSITION AIRCRAFT FLEETS TO NEW SCHEDULED MAINTENANCE

INTERVALS Interim Report
I. K. Cohen and Eugene Poggio Oct. 1979 37 p
(Contract F49620-77-C-0023)
(AD-A078806; RAND/N-1247-AF) Avail: NTIS HC A03/MF A01 CSCL 15/5

Typically, decisionmakers are called upon to make decisions on aircraft inspection intervals on the basis of very limited analytic information. Under such circumstances, decisionmakers are understandably concerned about the risks incurred in extending inspection intervals. This note presents in some detail a discussion of the phenomenon that although an immediate change is made in inspection intervals, it takes a considerable period of time for the fleet to transition to the changed interval. The slow fleet maturation may provide considerable opportunity to monitor and control the condition of the fleet during the transition period. Thus, in the case of extending inspection intervals, risk is reduced and spread over time while the payoff for the change is immediate. GRA

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*.

N80-19028 Engineering Sciences Data Unit, London (England).
UNDERCARRIAGE DRAG PREDICTION METHODS
1979 31 p
(ESDU-79015; ISBN-0-85679-260-8; ISSN-0141-391-397X)
For information on availability of series, sub-series, and other individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161. HC $770.50

A method for estimating the drag of an aircraft undercarriage is presented. The research is applied to the calculation of the drag of an aircraft in the landing approach. The results can be applied to virtually any type of fixed or retractable undercarriage at low speeds. ESDU (GRA)

N80-19029# Cambridge Univ. (England). Dept. of Engineering.
VISUALIZATION OF UNSTEADY JETS AND AERODYNAMIC NOISE FIELDS
S. N. Heavens 1979 51 p refs
(CUED/A-Turbo/TR-96; ISSN-0309-6521) Avail: NTIS HC A04/MF A01

Flow visualization and noise measurement techniques were used to study the response of a subsonic jet to internal excitation by various types of disturbance. In experiments with rectangular nozzles, the flow was perturbed by vibration of the nozzle walls or by the insertion of a tunable side-branch cavity in the nozzle duct. Both methods resulted in the periodic formation of cylindrical vortices in the jet mixing layer and in intense sound emission from the nozzle exit region at 90 deg to the jet axis. In experiments with circular nozzles, the flow was excited by the sound field from a transducer situated on the axis of the nozzle plenum chamber. The response of the jet pulse excitation was also investigated, using the transient acoustic pulse from a spark discharge. In these experiments an apparent intensification of the sound wave was observed, notably at 90 deg to the jet axis and in the forward arc. Large scale quasistable vortex ring structures were generated in the mixing layer. Interactions between the vortex rings were observed, but they did not appear to result in additional noise. Author

N80-19030*# Bihrle Applied Research, Inc., Jericho, N. Y.
ROTARY BALANCE DATA FOR A TYPICAL SINGLE-ENGINE GENERAL AVIATION DESIGN FOR AN ANGLE-OF-ATTACK RANGE OF 8 DEG TO 90 DEG. 1: LOW-WING MODEL A
Randy S. Hultberg and William Mulcay Feb. 1980 400 p refs
(Contract NAS1-14849)
(NASA-CR-3100) Avail: NTIS HC A17/MF A01 CSCL 01A

Aerodynamic characteristics obtained in a rotational flow environment utilizing a rotary balance are presented in plotted form for a 1/5 scale, single engine, low-wing, general aviation airplane model. The configuration tested included the basic airplane, various control deflections, tail designs, fuselage shapes, and wing leading edges. Data are presented without analysis for an angle of attack range of 8 to 90 deg and clockwise and counterclockwise rotations covering a range from 0 to 0.85. A.W.H.

N80-19031*# National Aeronautics and Space Administration, Washington, D. C.
APPLICATION OF A NUMERICALLY GENERATED ORTHOGONAL COORDINATE SYSTEM TO THE SOLUTION OF INVISCID AXISYMMETRIC SUPERSONIC FLOW OVER BLUNT BODIES
H. Harris Hamilton, II and Randolph A. Graves, Jr. Mar. 1980 61 p
(NASA-TP-1619; L-13353) Avail: NTIS HC A04/MF A01 CSCL 01A

A numerically generated orthogonal coordinate system (with the body surface and shock wave as opposite boundaries) was applied with a time asymptotic method to obtain steady flow solutions for axisymmetric inviscid flow over several blunt bodies including spheres, paraboloids, ellipsoids, hyperboloids, hemisphere cylinders, spherically blunted cones, and a body with a concavity in the stagnation region. Comparisons with experimental data and with the results of other computational methods are discussed. The numerically generated orthogonal coordinate system is described and applications of the method to complex body shapes, particularly those with concave regions, are discussed. A.W.H.

N80-19032# Weapons Systems Research Lab., Salisbury (Australia).
WIND TUNNEL TESTS OF A SPINNING 105 mm ARTILLERY SHELL MODEL WITH CANARD CONTROL SURFACES
C. Jermey Sep. 1979 46 p refs
(AR-001-908; WSRL-0122-TR) Avail: NTIS HC A03/MF A01

Tests were conducted to measure the aerodynamic characteristics of a spinning model of a 105 mm shell fitted with canard control surfaces. The tests covered an incidence range of -2 deg to 15 deg, a Mach number range of 0.70 to 0.95, and a control deflection range of zero to 30 deg. The effectiveness of the canards as pitch and yaw controls and for generating maneuvering forces is discussed. The conclusion is reached that available maneuvering forces would be small, and an example is given for a typical trajectory in which a maximum shift of 90 m from the unguided impact point could be obtained. F.O.S.

N80-19033*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A FLIGHT INVESTIGATION OF BLADE SECTION AERODYNAMICS FOR A HELICOPTER MAIN ROTOR HAVING NLR-1T AIRFOIL SECTIONS
Charles E. K. Morris, Jr., Dariene D. Stevens, and Robert L. Tomaine Jan. 1980 194 p refs Sponsored in part by AVRADCOM, St. Louis, Mo.
(DA Proj. TL2-62209-A-76)
(NASA-TM-80166; AVRADCOM-TR-80-B-2) Avail: NTIS HC A09/MF A01 CSCL 01A

A flight investigation was conducted using a teetering-rotor AH-1G helicopter to obtain data on the aerodynamic behavior of main-rotor blades with the NLR-1T blade section. The data system recorded blade-section aerodynamic pressures at 90 percent rotor radius as well as vehicle flight state, performance, and loads. The test envelope included hover, forward flight, and collective-fixed maneuvers. Data were obtained on apparent blade-vortex interactions, negative lift on the advancing blade in high-speed flight and wake interactions in hover. In many cases, good agreement was achieved between chordwise pressure distributions predicted by airfoil theory and flight data with no apparent indications of blade-vortex interactions. R.E.S.

N80-19034# Naval Postgraduate School, Monterey, Calif.
TRANSVERSE OSCILLATIONS OF SMOOTH AND ROUGH CYLINDERS IN HARMONIC FLOW M.S. Thesis
Suleyman Ozkaynak Sep. 1979 79 p refs

(AD-A078271) Avail: NTIS HC A05/MF A01 CSCL 20/11

The dynamic response of elastically-mounted cylinders in a sinusoidally oscillating two-dimensional flow has been investigated both theoretically and experimentally. The experiments were carried out in a large U-shaped water tunnel, with smooth and sand-roughened circular cylinders. The results have been expressed in terms of lift coefficients, relative amplitudes of oscillation, Keulegan-Carpenter number, Reynolds number, Strouhal number, and a mass parameter. A theoretical analysis has been carried out by assuming the transverse force varies harmonically. Furthermore, the instantaneous values of the displacement have been predicted through the use of the Duhamel's integral. The results have shown that elastically-mounted cylinders undergo synchronous oscillations at a reduced velocity of 5.7 when the vortex shedding frequency coincides with the natural frequency of the cylinder. Away from the region of synchronization the cylinder is subjected to forced response by vortices shedding at a frequency smaller or larger than the natural frequency of the cylinder. GRA

N80-19035# Massachusetts Inst. of Tech., Cambridge. Acoustics and Vibration Lab.

WALL PRESSURE FLUCTUATIONS DURING TRANSITION ON A FLAT PLATE Final Report, Oct. 1976 - Apr. 1979

Charles Joseph Gedney Apr. 1979 114 p refs

(Contract N00014-77-C-0084)

(AD-A075379; A/V-84618-1) Avail: NTIS HC A06/MF A01 CSCL 20/4

Detailed measurements of wall pressure fluctuations have been made in the intermittent region of a flat plate boundary layer. Digital sampling and processing were used. The properties of these pressure fluctuations were found to be similar to the previous measurements made in the fully turbulent region. The measurements were repeated with a single two dimensional surface roughness on the plate. The only changes in the results were a decrease in the transition Reynolds number from 2.0 to 1.2 million per foot and an increase in the decay rate of the longitudinal cross-spectral density magnitude by a factor of about 1.5. Emmons' analytical model of the burst rate in the transition region was found to be inaccurate. His model treats the sources of the turbulent spots as independent random events with prescribed probability density functions. Both a delta function and a constant were used as the source density functions and in each case the burst rate was about two times higher than the present measurements. GRA

N80-19036# Ballistic Research Labs., Aberdeen Proving Ground, Md.

FREE-FLIGHT BASE PRESSURE MEASUREMENTS ON 8 DEGREE CONES

Andrew Mark Jul. 1979 26 p refs

(DA Proj. 1W6-62618-AH-80)

(AD-A075365; AD-E430301; ARBRL-TR-02179) Avail: NTIS HC A03/MF A01 CSCL 19/4

Base pressure measurements are presented on two 8 deg half angle, right circular cones with a tip bluntness ratio of 1%. Data are obtained at three radical base locations: r/R sub b = 0, r/R sub b = .5, and r/R sub b = .917. A unique free-flight technique was employed to obtain the data. The cones were launched nearly vertically from special guns and the data were telemetered to ground stations. The launch Mach numbers were approximately 3 with corresponding Reynolds numbers of 35 million. Both the Mach number and the Reynolds number decreased monotonically from their launch value reaching 400 and 250,000 respectively at apogee. In the laminar flow regime, the centerline base pressure is measured to be a few percent higher than either of the other two. At early times in the trajectory, where the boundary layer was expected to be turbulent, the opposite effect is noted. GRA

N80-19037# New Mexico State Univ., Las Cruces. Physical Science Lab.

BALLOON SYSTEMS AND LAUNCH SUPPORT Final Report, 1 Oct. 1976 - 31 Jan. 1979

Stewart P. Bean and John R. Ground 15 Apr. 1979 18 p refs

(Contract F19628-77-C-0031)

(AD-A075385; AFGL-TR-79-0175) Avail: NTIS HC A02/MF A01 CSCL 14/2

The work performed under this contract consisted of: conducting balloon flight operations from selected sites; integrating GFE instrumentation and flight safety equipment into balloon borne payloads; providing engineering support for payload integration and integrity; fabricating, calibrating and repairing command control/telemetry equipment; analyzing data; and reporting flight results. GRA

N80-19038# New Mexico State Univ., Las Cruces. Physical Science Lab.

SOUNDING ROCKET AND BALLOON SYSTEMS SUPPORT Final Report, 15 Jun. 1976 - 15 Jun. 1979

Raymond A. Bumgarner and Arthur A. Gilcrease 18 Jul. 1979 7 p refs

(Contract F19628-76-C-0171; AF Proj. 6688)

(AD-A075384; PS-00945; AFGL-TR-79-0166) Avail: NTIS HC A02/MF A01 CSCL 14/2

The work performed under this contract consisted of the following: integrate, calibrate, and test, GFE range safety radar tracking beacon and parachute recovery systems; design and develop special devices as required, operate and maintain GFE telemetry station to support telemetry operations at WSMR, New Mexico, and calibrate equipment and perform analyses for air sampling balloon flights conducted at Holloman AFB, New Mexico. GRA

N80-19039# United Technologies Research Center, East Hartford, Conn.

INVESTIGATION OF THE AIRFLOW AT ROCKET TRAJECTORY AND WIND SENSOR LOCATIONS OF A MODEL HELICOPTER SIMULATING LOW SPEED FLIGHT. APPLICATION OF MODEL HELICOPTER TESTING, LASER VELOCITY, AND ROTOR WAKE FLOW VISUALIZATION TO INVESTIGATE THE AERODYNAMIC INTERFERENCE AT ROCKET TRAJECTORIES AND WIND SENSORS OF A HELICOPTER OPERATING IN LOW SPEED FLIGHT Final Report, May 1977 - Sep. 1979

Robert B. Taylor and Anton J. Landgrebe Sep. 1979 233 p refs

(Contract DAAG29-77-C-0013)

(AD-A075378; UTRC-R79-912985-5; ARO-14277.1-E) Avail: NTIS HC A11/MF A01 CSCL 01/3

An experimental investigation was conducted to determine the airflow characteristics in the vicinity of a model helicopter to determine the aerodynamic interference at representative rocket trajectories and wind sensor locations of an Army AH-1G helicopter operating in low speed forward flight. Laser velocimetry and flow visualization techniques were applied in a wind tunnel to provide flow velocity and wake geometry data for use in a rocket aeroballistics analysis, correlation with theory, and for a systematic determination of the influence of the helicopter components (rotor, fuselage, and wing) and significant operating condition parameters (flight speed, flight direction, ground effect, gross weight, and aircraft/rocket attitude) on the airflow influencing rocket trajectories. In addition, the flow velocities at potential locations for a fire control wind sensor mounted on the helicopter were determined to evaluate potential wind sensor locations for accurately measuring flow velocities at the low flight speeds required in accordance with current terrain flying/rocket firing tactics. GRA

N80-19040# ARO, Inc., Arnold Air Force Station, Tenn.

WIND TUNNEL TEST TO INVESTIGATE AERODYNAMIC HYSTERESIS PHENOMENA OF THE F-4 AND F-11 AIRCRAFT MODELS

Joseph F. Herman AEDC 15 May 1979 37 p

(AD-A077196; AEDC-TSR-79-P27) Avail: NTIS HC A03/MF A01 CSCL 01/3

Wind tunnel tests were conducted to investigate aerodynamic hysteresis phenomena found in other investigations of the F-4 and F-111 aircraft models. A 1/20-scale model of the F-4C aircraft was used to obtain static force, moment and wing pressure data in pitch and sideslip over a Mach number range from 0.7 to 0.95. A 1/24-scale model of the F-111 aircraft was used to obtain static force and moment data for a Mach number range of 0.7 to 1.3. Data on the F-111 were obtained for wing

sweep angles of 26 and 54 deg. In addition, tuft and oil flow visualization data were obtained for selected configurations. GRA

N80-19041# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio. Recovery Crew Station Branch.
RECOVERY SYSTEM PRELIMIMINARY DESIGN. A SIMPLIFIED APPROACH TO DETERMINING STAGING, TIMING AND ALTITUDE REQUIREMENTS FOR FAST INFLATING PARACHUTES Final Report, 13 Feb. - 1 Jun. 1976
Michael W. Higgins Sep. 1979 74 p
(AF Proj. 6065)
(AD-A077548; AFFDL-TR-79-3007) Avail: NTIS HC A04/MF A01 CSCL 01/3

Determining a recovery system design that will take a specified act of initial conditions and will operate within a given set of constraints to provide a required final condition is a complex task. To perform this task, current design practices make extensive use of both person hours and computer time in an analytical 'cut and try' process. This report documents an analytical technique that takes a specified set of inputs (initial conditions, final conditions and operating constraints) and outputs a 'reasonable' recovery system preliminary design for fast inflating parachutes. The output includes the number of operating stages, the drag area of each operating stage, the reefing cutter times, and resulting altitude losses. The technique assumes a vertical trajectory, step function increases in parachute drag area, and that the recovery system is a point mass. The limitations of the analytical technique are discussed and recommendations are made with respect to reducing or removing the effects of these limitations. The analytical technique is applied to three different sets of conditions and constraints as example applications. Use of the analytical technique documented in this report will significantly reduce the assets required to arrive at a final recovery system design. GRA

N80-19042# Naval Postgraduate School, Monterey, Calif.
PROCEEDINGS OF A WORKSHOP ON V/STOL AIRCRAFT AERODYNAMICS, VOLUME 2
C. Henderson and M. F. Platzer 18 May 1979 474 p refs
Workshop held in Monterey, Calif., 16-18 May 1979
(AD-A078909) Avail: NTIS HC A20/MF A01 CSCL 20/4

Contents: Propulsion System/Airframe Interactions--Recent Applications of Theoretical Analysis to V/STOL Inlet Design, Inlet Operating Characteristics at High Angles of Attack, Low Speed Development of the Supersonic XFV-12A V/STOL Inlet, Subsonic VTOL Inlet Experimental Results, Inlet Ram Forces and Moments and V/STOL Aircraft, Theoretical Fan Velocity Distortions Due to Inlets and Nozzles, Aerodynamics of a Tilt-Nacelle V/STOL Propulsion System, Isolated Deflector Nozzle Static Tests for V/STOL Aircraft; V/STOL Aircraft Configurational Considerations and Developments--High Angle of Attack Aerodynamics at DTNSRDC, Development of High Lift Devices for Application to Advanced Navy Aircraft, YC-14 Low Speed Test Techniques, Vectored-Engine-Over-Wing Concept Development, Wind Tunnel Investigation of a Highly Maneuverable Supersonic V/STOL Fighter, Transition Characteristics of the External-Augmentor V/STOL Aircraft Concept, Calculation of Forces and Moments Acting on an Augmentor Wing for a VTOL Fighter in Hover or Transition Flight, Aerodynamics of an Advanced Jet Flap and an Ultra-STOL Application, and High Speed Aerodynamic Technology for V/STOL Fighter Attack Aircraft. GRA

N80-19043# Dayton Univ. Research Inst., Ohio.
FAR FIELD CONDITIONS FOR SUBSONIC FLOWS WITH SMALL SUPERIMPOSED HARMONIC OSCILLATIONS Interim Report, Dec. 1978 - Apr. 1979
Karl G. Guderley Jul. 1979 65 p refs
(Grant AF-AFOSR-3524-78; AF Proj. 2304)
(AD-A077693; UDR-TR-79-65; AFFDL-TR-79-3109) Avail: NTIS HC A04/MF A01 CSCL 20/4

For numerical work one needs boundary conditions (so called far field conditions) at the outer edge (or surface) of the region of the flow field for which the computations are carried out. In oscillatory flows with higher frequencies and Mach number close to 1 these conditions become crucial and the formulation in use at present which is patterned after far field conditions in steady flows becomes impractical if not useless. The far field conditions express the fact that no waves coming from infinity are present. Mathematically this appears in the form of the requirement that the far field can be represented by a superposition of particular solutions which represent outgoing waves. On this basis one obtains by the application of Green's formula a number of integral conditions. An example shows that even with this formulation one will encounter numerical difficulties (because of latent standing waves) if one tries to solve the flow equations by iteration. Fortunately the new far field conditions are well suited to a solution of the problem by direct elimination, possibly combined with a refinement of the results by the multigrid method of Brand. GRA

N80-19044# Science Applications, Inc., Irvine, Calif.
HYPERSONIC INTERFERENCE FLOW FLIGHT EXPERIMENT DESIGN Final Report, 15 Jun. - 15 Apr. 1979
L. A. Cassel, T. C. Duncan, and E. H. Lahti Jun. 1979 244 p refs
(Contract F33615-77-C-3043; AF Proj. 2404)
(AD-A078861; SAI-175-80-008-R; AFFDL-TR-79-3065) Avail: NTIS HC A11/MF A01 CSCL 20/4

An experiment has been defined to measure the aeroheating and loads resulting from three-dimensional shock wave/boundary layer interference in hypersonic flight. This report describes the definition of this flight experiment, including the instrumentation and electronics required to measure the interference heating and loads and transmit those measurements by telemetry to ground stations. The measurements include quasi-steady heat transfer rates and pressures as well as fluctuating pressures. Additional measurements are specified for specific definition of the experiment environment. The experiment is configured to investigate the interference flow at the base of a stabilizer on a missile launched from an F-4 aircraft. The missile is to be propelled to hypersonic speed by a solid propellant motor and the measurements are to be made at altitudes between 50 KFT and ground impact. The mechanical, structural, and thermal protection system specifications for the experiment carrier missile are provided in this report. Missile design and fabrication drawings are available under separate cover from the sponsoring agency. GRA

N80-19045# Scientific Research Associates, Inc., Glastonbury, Conn.
VISCOUS FLOW IN THE REGION OF A ROUNDED TRAILING EDGE Final Report, 1 Jul. 1978 - 30 Jun. 1979
Ralph Levy, W. Roger Briley, and Henry McDonald 31 Jul. 1979 41 p refs
(Contract N00019-78-C-0470)
(AD-A078588; R79-920003-F) Avail: NTIS HC A03/MF A01 CSCL 20/4

The Interactive Zone Embedding concept is a generalization of concepts which have been used for some time with boundary layer analyses. This concept has been extended to more complex flows using a potential flow for the outer zone and the compressible Navier-Stokes equations for the inner zone. In this interactive manner the flow about a rounded trailing edge was computed for two locations of the outer boundary. The calculations were performed on a 5:1 elliptic cylinder at a Mach number of 0.2 and a Reynolds number based on chord of 1,000. A body fitted conformal coordinate system was used. In the first instance the outer boundary was located approximately one chord from the ellipse and in the second the outer boundary was brought to about one-half chord of the ellipse. The displacement body was chosen as the interactive streamline and the potential flow over this streamline was computed as the sum of the analytic potential flow over the elliptic cylinder plus the flow from a series of sources. The strengths of these sources were determined to make the interaction streamline also be a streamline in the potential flowfield. The resulting potential flow was used to evaluate the static pressure at the outflow boundary of the Navier-Stokes zone. The calculations were performed with the large Navier-Stokes domain and were repeated with a smaller Navier-Stokes domain. The flow properties in the vicinity of the body of the two calculations were in excellent agreement. GRA

N80-19046# Naval Ship Research and Development Center, Bethesda, Md. Aviation and Surface Effects Dept.
EXPERIMENTAL INVESTIGATION OF A CIRCULATION CONTROL AILERON Final Report, Oct. 1977 - Sep. 1978

Steven W. Prince Jul. 1979 29 p refs
(WF41421000)
(AD-A078825; DTNSRDC/ASED-79/08) Avail: NTIS HC A03/MF A01 CSCL 20/4

A Circulation Control (CC) aileron was tested on a semispan wing-fuselage model at a dynamic pressure equal to 20 lb/sq ft (957 N/sq m) and a Reynolds number of 0.8 million per ft (2.62 million per m). Three different trailing edge geometries were used on CC ailerons of 10 and 20 percent of the half span. Blowing was controlled to produce jet momentum coefficients from 0.0017 to 0.0124. Rolling moment coefficients as high as 0.035 were recorded for the 20 percent CC aileron for angles of attack between 0 and 12 deg. The CC aileron was at least three times as effective as a pure reaction jet for the same amount of bleed air. Adverse yaw was large, on the order of one-half of the rolling moment. GRA

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

N80-19047# Advisory Group for Aerospace Research and Development, Paris (France).
PROPULSION AND ENERGETICS PANEL WORKING GROUP 11 ON AIRCRAFT FIRE SAFETY. VOLUME 2: MAIN REPORT
B. P. Botteri, ed., M. Gerstein, ed., T. Horeff, ed., and J. Parker, ed. Nov. 1979 167 p 2 Vol.
(AGARD-AR-132-Vol-2; ISBN-92-835-1344-4) Avail: NTIS HC A08/MF A01

Recent aircraft fire experience was analyzed and areas in which fire protection enhancement is needed were delineated. Technological opportunities that offer significant prospect for improvement of safety and personnel survivability were also identified. Because of the complexity of the overall problems, attention was focused upon turbine engine powered transport aircraft in a conventional (non-combat) operational environment. Conclusions and recommendations are summarized. R.E.S.

N80-19048*# TRW Defense and Space Systems Group, Redondo Beach, Calif.
DATA REDUCTION AND ANALYSIS OF GRAPHITE FIBER RELEASE EXPERIMENTS
Paul Lieberman, Albert R. Chovit, Benjamin Sussholz, and Howard F. Korman Jul. 1979 362 p refs
(Contract NAS1-15465)
(NASA-CR-159032; NASA/TRW-79-2) Avail: NTIS HC A16/MF A01 CSCL 01C

The burn and burn/explode effects on aircraft structures were examined in a series of fifteen outdoor tests conducted to verify the results obtained in previous burn and explode tests of carbon/graphite composite samples conducted in a closed chamber, and to simulate aircraft accident scenarios in which carbon/graphite fibers would be released. The primary effects that were to be investigaged in these tests were the amount and size distribution of the conductive fibers released from the composite structures, and how these various sizes of fibers transported downwind. The structures included plates, barrels, aircraft spoilers and a cockpit. The heat sources included a propane gas burner and 20 ft by 20 ft and 40 ft by 60 ft JP-5 pool fires. The larger pool fire was selected to simulate an aircraft accident incident. The passive instrumentation included sticky paper and sticky bridal veil over an area 6000 ft downwind and 3000 ft crosswind. The active instrumentation included instrumented meteorological towers, movies, infrared imaging cameras, LADAR, high voltage ball gages, light emitting diode gages, microwave gages and flame velocimeter. A.R.H.

N80-19049# Computer Sciences Corp., Huntington Valley, Pa.
MICROPROCESSOR CONTROLLED EJECTION SEAT Final Report
Kathleen M. Breakey 23 Oct. 1979 208 p refs
(Contract N66269-78-C-0191)
(AD-A077479; NADC-79240-60) Avail: NTIS HC A10/MF A01 CSCL 01/3

The operation of an ejection seat depends on a number of devices on the seat performing certain tasks at specific times. Traditionally, the timing and sequencing of these tasks have been controlled by fuses, gas lines and mechanical linkages, with marginal accuracy and limited logic. This effort was undertaken to demonstrate the feasibility of using a microprocessor to control these functions with increased accuracy and more sophisticated logic. The microprocessor provides timing by electronic clock, event sequencing via electrical signals, and sophisticated logic based on environmental inputs. In addition, the microprocessor, in conjunction with a gimballed rocket motor, provides the capability of performing a Vertical Seeking Maneuver in the event of an adverse attitude ejection. This report contains the software required to complement all these functions. GRA

N80-19050# Operational Research and Analysis Establishment, Ottawa (Ontario).
FEASIBILITY STUDY ON A CANADIAN CIVIL SAR PLAN FOR SEARCH AND RESCUE DUTIES
S. L. Milligan Apr. 1979 122 p
(AD-A075392; ORAE-M87) Avail: NTIS HC A06/MF A01 CSCL 06/7

The ability and willingness of the civil sector to assist the military in carrying out its statutory search and rescue (SAR) role is studied. Results are presented of a questionnaire to determine the available resources and general attitude. Existing civilian SAR groups are assessed to determine strengths and weaknesses of each type of organization. The role of federal and provincial government departments is explained. Recommendations include the development of a national volunteer SAR organization, which can be implemented in stages. GRA

N80-19051# Perceptronics, Inc., Woodland Hills, Calif.
AIRCRAFT EMERGENCY DECISIONS: COGNITIVE AND SITUATIONAL VARIABLES Annual Technical Report
Rosemarie Hopf-Weichel, Luigi Lucaccini Joseph Saleh, and Amos Freedy Jul. 1979 171 p refs
(Contract F49620-78-C-0067; AF Proj. 2313)
(AD-A077413; PATR-1065-79-7; AFOSR-79-1175TR) Avail: NTIS HC A08/MF A01 CSCL 01/2

Military aircraft accidents are important not only to the individuals directly involved, but also to those responsible for preparing and maintaining combat-ready forces for the nation's defense. This report addresses problems underlying aircraft emergency situations. A literature review provided background information, and an analysis of selected accident reports. A workshop was convened to review the state-of-the-art of aircrew emergency decision training, safety research, and behavioral decision theory. A selected set of emergency situations was the basis of a preliminary classification of aircraft emergency situations in terms of several situational and decision making attributes. The classification is based on data derived from interviews with experienced military flying personnel. A taxonomy of emergency situation types was developed, incorporating both situational and task specific elements as cognitive attributes of the decision tasks performed under emergency conditions. On the basis of the taxonomy, three classes of emergency situations were found to be of interest: Situation 1 (predictable) Situation 2 (partly predictable), and Situation 3 (unpredictable). Initial training guidelines are suggested in light of the cognitive requirements of each class. GRA

N80-19052# RAND Corp., Santa Monica, Calif.
AIRCRAFT ICING DURING LOW-LEVEL FLIGHTS Interim Report
Robert R. Rapp Nov. 1979 19 p refs
(Contract F49620-77-C-0023)
(AD-A078843; RAND/N-1311-AF) Avail: NTIS HC A02/MF A01 CSCL 91/2

The reasons why icing may hinder low and slow flights are presented. A crude measure of the potential of icing near the ground is presented and it is shown that, by this measure, icing may be a serious problem when flying over the higher terrain

of central Europe. Some suggestions for improving the measure of icing potential are given. GRA

N80-19053# Stencel Aero Engineering Corp., Asheville, N. C.
PROTOTYPE DEVELOPMENT PASSIVE, SEAT-MOUNTED LIMB RETENTION SYSTEM Final Report, Sep. 1977 - May 1979
May 1979 94 p refs
(Contracts N62269-77-C-0251; WF140000)
(AD-A076331; NADC-79201-60) Avail: NTIS HC A05/MF A01 CSCL 01/3

It has been well documented that the predominant cause of injury (both major and minor) occurring from combat ejections during the Southeast Asia conflict was due to flailing of the extremities as a result of increased ejection speed. A prototype passive seat mounted limb retention system was developed and manufactured which does not require the aircrewman to wear any additional devices or fasten additional restraint connections. It will not, in any way, compromise his movement in the cockpit or his control of the aircraft. This functional prototype device will undergo feasibility testing to determine acceptability for further development. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications*.

N80-19054# Federal Aviation Administration, Washington, D. C.
AIRBORNE RADAR APPROACH SYSTEM FLIGHT TEST EXPERIMENT Final Report
L. D. King and R. J. Adams Oct. 1979 127 p refs
(Contract DOT-FA79WA-4293)
(AD-A077900; FAA-RD-79-99) Avail: NTIS HC A07/MF A01 CSCL 17/7

The performance of airborne radar as an approach aid is analyzed using data from the airborne radar approach (ARA) system flight tests experiment. The experiment design, equipment used, and test objectives are reviewed. The ARA tests were performed utilizing the Bendix RDR-1400a airborne radar system. The test vehicle was a CH-53A helicopter. Test airspace environments included airport, remote sites, and offshore areas. Flight tests for ARA accuracy and procedures development were performed in both skin paint and single beacon radar operating modes. The technical and operating performance, in flight considerations, the development of pilot procedures, and detailed accuracy data for each area of testing are discussed. A.W.H.

N80-19055*# Analytical Mechanics Associates, Inc., Mountain View, Calif.
NAVIGATION SYSTEMS FOR APPROACH AND LANDING OF VTOL AIRCRAFT
Stanley F. Schmidt and Richard L. Mohr Oct. 1979 63 p refs
(Contract NAS2-9430)
(NASA-CR-152335; AMA-79-15) Avail: NTIS HC A04/MF A01 CSCL 17G

The formulation and implementation of navigation systems used for research investigations in the V/STOLAND avionics system are described. The navigation systems prove position and velocity in a cartestian reference frame aligned with the runway. They use filtering techniques to combine the raw position data from navaids (e.g., TACAN, MLS) with data from onboard inertial sensors. The filtering techniques which use both complementary and Kalman filters, are described. The software for the navigation systems is also described. R.E.S.

N80-19056*# Ohio Univ., Athens. Avionics Engineering Center.
ANALYSIS OF FIRST AND SECOND ORDER BINARY QUANTIZED DIGITAL PHASE-LOCKED LOOPS FOR IDEAL AND WHITE GAUSSIAN NOISE INPUTS
Paul R. Blasche Mar. 1980 126 p refs
(Grant NGR-36-009-017)
(NASA-CR-162854; TM-25) Avail: NTIS HC A07/MF A01 CSCL 17G

Specific configurations of first and second order all digital phase locked loops are analyzed for both ideal and additive white gaussian noise inputs. In addition, a design for a hardware digital phase locked loop capable of either first or second order operation is presented along with appropriate experimental data obtained from testing of the hardware loop. All parameters chosen for the analysis and the design of the digital phase locked loop are consistent with an application to an Omega navigation receiver although neither the analysis nor the design are limited to this application. Author

N80-19057# Naval Postgraduate School, Monterey, Calif.
APPLICATION OF LORAN-C POSITIONING TO HYDROGRAPHIC SURVEYING M.S. Thesis
Kurt J. Schnebele Sep. 1979 51 p refs
(AD-A078278) Avail: NTIS HC A04/MF A01 CSCL 08/8

The possible application of hyperbolic Loran-C as a positioning system for hydrographic surveys was investigated. It was found that the present capabilities of the system did not meet the 40 meter (drms) accuracy required for offshore surveys. The use of differential Loran-C techniques and geodetic calibration procedures was examined. A field test was conducted in Monterey Bay, California, using a microwave positioning system to test the accuracy of the West Coast Loran-C chain, specifically the 9940-W and Y rates. Overland propagation corrections for the test area are presented. It was found that scrupulous application of the differential technique and rigorous calibration procedures improved the absolute position accuracy of a mobile Loran-C receiver to something less than 100 meters (drms). GRA

N80-19058# Colorado Research and Prediction Lab., Boulder.
LORAN-C PULSE TRANSIENT PROPAGATION. PART 1: GEOPHYSICAL AND GEOLOGICAL DATA BASE EVALUATION FOR LORAN-C GROUND WAVE PROPAGATION MEDIUM. PART 2: LORAN-C GROUND WAVE SECONDARY PHASE CORRECTIONS OVER NONHOMOGENEOUS PROPAGATION TECHNIQUES. PART 3: AN EXPERIMENTAL PROGRAM TO MEASURE ECD AND TEST THE TRANSIENT SOLUTION, WITH ADDENDUM Final Report, 1 Sep. 1978 - 1 May 1979
J. Ralph Johler, R. H. Doherty, and A. R. Cook May 1979 218 p refs
(Contract DOT-CG-842923-A)
(AD-A077551; CRPLI-78-9-Pt-1; CRPLI-78-9-PT-2; CRPLI-78-9-Pt-3; USCG-D-52-79-Pt-1; USCG-D-52-79-Pt-2; USCG-D-52-79-Pt-3) Avail: NTIS HC A10/MF A01 CSCL 17/7

The geophysical data available for a select propagation path for use in the study of the propagation of a Loran-C pulse is evaluated and recommendations for the initial estimates of ground geoelectric section resistivities is presented. A new rigorous technique for the computation and prediction of loran time difference coordinates from loran receiver geographic coordinates and visa versa is introduced by application to a specific loran overland situation. The full wave theoretical transient solution for the Loran-C pulse is employed. An experimental program to validate the theoretical transient solution for the Loran-C pulse is presented. GRA

N80-19059# Army Communications-Electronics Engineering Installation Agency, Fort Huachuca, Ariz.
STANDARD ENGINEERING INSTALLATION PACKAGE. AIR TRAFFIC RADIO CHANNEL CONTROL (ATRCC) EQUIPMENT Final Report
Nov. 1979 90 p refs
(AD-A077648; USACEEIA-SEIP-036) Avail: NTIS HC A05/MF A01 CSCL 17/7

This Standard Engineering Installation Package SEIP provides information for the engineering and installation of ATRCC facilities worldwide. Information provided consists of site survey data, siting criteria, installation specifications and instructions, a bill

of materials, quality assurance procedures and completion certification format. Information provided must be adapted to the specific ATRCC facility/location by the project engineer.
Author (GRA)

N80-19043# Draper (Charles Stark) Lab., Inc., Cambridge, Mass. Guidance and Navigation Advanced Programs Div.
CRUISE-MISSILE-CARRIER NAVIGATION REQUIREMENTS
George T. Schmidt and Roy H. Setterlund *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 10 p refs (For primary document see N80-19809 10-59)
(Contract F33657-78-C-0473)
Avail: NTIS HC A24/MF A01

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.
For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N80-19060 Engineering Sciences Data Unit, London (England).
ESTIMATION OF THE ENDURANCE OF CIVIL AIRCRAFT WING STRUCTURES
1979 14 p
(ESDU-79024; ISBN-0-85679-272-1; ISSN-0141-3996) For information on availability of series, sub-series, and other individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161. HC $386.50

A method of analyzing the cumulative frequency spectrum for an aircraft wing station into discrete loading cycles in preparation for a fatique damage calculation is described. The calculations derive the mean life estimation of a wing structure. The results apply to civil or transport aircraft in which maneuver loadings are small. ESDU

N80-19061# Dynamics Research Corp., Wilmington, Mass. Systems Div.
APPLICATION OF THE ESTIMATION-BEFORE-MODELING (EBM) SYSTEM IDENTIFICATION METHOD TO THE HIGH ANGLE OF ATTACK/SIDESLIP FLIGHT OF THE T-2C JET TRAINER AIRCRAFT. VOLUME 2: SIMULATION STUDY USING T-2C WIND TUNNEL MODEL DATA Final Report
Harold L. Stalford and S. Ramachandran 23 Jun. 1978 275 p refs 3 Vol.
(Contract N62269-76-C-0342)
(AD-A079923; R-254U-Vol-2; NADC-76097-30-Vol-2; Rept-1273-Vol-2) Avail: NTIS HC A12/MF A01 CSCL 20/4

This report presents the results of a feasibility study of the Estimation-Before-Modeling (EBM) method for aerodynamic parameter identification in the stall/post stall flight regimes. The feasibility study is conducted by processing synthetic flight data generated by exciting a wind tunnel model of the Navy's T-2C, a light jet trainer aircraft. It is carried out under realistic conditions by using the controls and the initial conditions of sixteen actual T-2C flight test data records to generate the sixteen synthetic maneuvers used in the study. The synthetic data are corrupted by realistic measurement noise levels representative of the actual. The EBM method is a two stage process. In the first stage, the corrupted data are processed one maneuver at a time using an extended Kalman-Bucy filter/Bryson-Frazier smoother to obtain estimated values of the states and of the forces and moments acting on the aircraft. In the second stage, subspace modeling together with a step-wise multiple linear regression technique is used to process the estimated values from all sixteen maneuvers together in parallel to identify a global state/control dependent model of the three force coefficients and the three moment coefficients. The identified global model compares well with the true values of the T-2C wind tunnel model. The EBM method is demonstrated to accurately identify the high nonlinearities of the T-2C wind tunnel model. The prediction accuracy of the identified global model is shown to be excellent by a comparison of the responses for a new maneuver and for the original sixteen maneuvers. GRA

N80-19062# Drexel Univ., Philadelphia, Pa.
SIGNIFICANCE OF LARGE SCATTER OF COMPOSITE PROPERTIES TO AIRCRAFT RELIABILITY Final Report
Pei Chi Chou and Robert Croman Sep. 1979 48 p refs
(Contract N62269-78-C-0267)
(AD-A077804; NADC-78094-60) Avail: NTIS HC A03/MF A01 CSCL 01/3

Statistical calculations have been made for the static load reliability of an aircraft fleet assuming typical metallic and composite strength distributions. A factor of safety is defined as the element strength divided by the 'weakest of the fleet' strength. Element strength is typical 'A' or 'B' basis material allowables. 'Weakest of the fleet' strength is calculated statistically assuming each aircraft to be made up of a realistic arrangement (in-series or in-parallel) of critical elements. Similar calculations are also made for fatigue life. It is shown that the reliability of the current damage tolerant design, such as multiple load path and crack stoppers, can be specified in quantitative terms. GRA

N80-19063*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
CLOSED LOOP MODELS FOR ANALYZING ENGINEERING REQUIREMENTS FOR SIMULATORS Final Report
Sheldon Baron, Ramal Muralidharan, and David Kleinman Feb. 1980 232 p refs
(Contract NAS1-14449)
(NASA-CR-2965) Avail: NTIS HC A11/MF A01 CSCL 14B

A closed loop analytic model, incorporating a model for the human pilot, (namely, the optimal control model) that would allow certain simulation design tradeoffs to be evaluated quantitatively was developed. This model was applied to a realistic flight control problem. The resulting model is used to analyze both overall simulation effects and the effects of individual elements. The results show that, as compared to an ideal continuous simulation, the discrete simulation can result in significant performance and/or workload penalties. J.M.S.

N80-19064# Grumman Aerospace Corp., Bethpage, N.Y.
CREW STATION DESIGN FACILITY FEASIBILITY STUDY Final Technical Report, Sep. 1977 - Dec. 1978
S. LaCarrubba May 1979 189 p
(Contract F33615-77-C-3067; AF Proj. 2403; AF Proj. 6190)
(AD-A078134; AFFDL-TR-79-3037) Avail: NTIS HC A09/MF A01 CSCL 01/3

This report addresses the feasibility of a new and unique facility capable of simulating the total range of lighting conditions experienced in military aircraft crew stations during operational flight. The facility would provide a means for evaluating the impact of extreme illumination levels on the legibility of displays and instruments/panel lighting systems to be incorporated in advanced crew stations. This facility would interface with the flight simulation test facilities already established at the Flight Control Development Laboratory at WPAFB. At the beginning of this effort, two baseline lighting simulation systems were selected for development. One configuration uses an opaque dome shaped lighting enclosure with internal sky illumination sources. The other configuration uses a translucent enclosure with external sky illumination sources. Techniques for simulating air-to-air and air-to-ground visual effects, terrain, and motion simulation were investigated for each baseline configuration. The principal conclusion of this study is that real levels of sky and sun luminance, colors and color shading can be simulated and controlled (with some limitations) utilizing the translucent dome lighting enclosure with external sky illumination sources. GRA

N80-19065# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
USAF DAMAGE TOLERANT DESIGN HANDBOOK: GUIDELINES FOR THE ANALYSIS AND DESIGN OF DAMAGE TOLERANT AIRCRAFT STRUCTURES, REVISION A Interim Report, Jan. 1977 - Nov. 1978
Howard A. Wood and Robert M. Engle, Jr. Mar. 1979 447 p Revised
(AF Proj. 2401)
(AD-A078216; AFFDL-TR-79-3021-Rev-A) Avail: NTIS

HC A19/MF A01 CSCL 01/3

This is the first edition of a handbook to support the USAF Airplane Damage Tolerance Requirements contained in MIL-A-83444. It provides specific background data and justification for the detailed requirements of MIL-A-83444 and provides guidelines and state-of-the-art analysis methods to assist contractor and USAF personnel in complying with the intent of the specification and in solving cracking problems in general, for metallic aircraft structures. The material in this document is general enough to be useful in the evaluation of the damage tolerance of in-service aircraft designed and qualified prior to the issuance of MIL-A-83444. The handbook was structured to provide a clear and concise summary of the specification, MIL-A-83444, as well as supporting analysis methods, test techniques, and nondestructive inspection (NDI). Methods are provided as state-of-the-art along with suggested and/or recommended practices, limitations, etc. Copies of appropriate USAF structural specifications are contained as an appendix. GRA

N80-19066# Boeing Aerospace Co., Seattle, Wash.

NEW REMOTELY PILOTED VEHICLE LAUNCH AND RECOVERY CONCEPTS. VOLUME 1: ANALYSIS, PRELIMINARY DESIGN AND PERFORMANCE/COST TRADE STUDIES Final Report, Mar. 1978 - Mar. 1979

Steven J. Baumgartner, James G. Brister, Vinod K. Rajpaul, and Roger F. Yurczyk Jun. 1979 259 p refs

(Contract F33615-78-C-3404; AF Proj. 2402)

(AD-A077475; AFFDL-TR-79-3069-Vol-1) Avail: NTIS

HC A12/MF A01 CSCL 01/3

Dynamic analysis, preliminary design, and performance/cost trade studies of air bag skid and air cushion concepts for launch and recovery of Boeing and Rockwell advanced RPV concepts have been conducted. Dynamic analysis was performed using the six degree-of-freedom computer program EASY. Dynamic simulations included perturbations to steady state flight, landing, and takeoff simulations. Launch and recovery concepts investigated were air bag skid system, air cushion recovery systems, integrated air cushion system, and air cushion launch platform. Performance/cost trade study factors investigated were complexity, fuel requirements, adverse weather capability, ground equipment and facility requirements, survivability/vulnerability, reliability and maintainability, and system acquisition and life cycle costs. Results of the study indicated that an air cushion system is a feasible means of recovery of an RPV such as the Boeing and Rockwell ARPV concepts. An air bag skid with an arrestor system is a feasible approach when minimum field length is a major design factor. Integrated air cushion systems for launch and recovery are greatly affected by engine characteristics. In each case, the launch and recovery systems are shown to be an integral part of the total vehicle design and strongly influence the airframe design. GRA

N80-19067# Army Aviation Engineering Flight Activity, Edwards AFB, Calif.

PRELIMINARY AIRWORTHINESS EVALUATION UH-1H HELICOPTER EQUIPPED WITH MULTIPLE TARGET ELECTRONIC WARFARE SYSTEM (MULTEWS) Final Report, 13 Aug. - 2 Dec. 1977

Vernon L. Diekmann, Sherwood C. Spring, Mathews S. Mathews, III, John F. Hagen, and John S. Tulloch May 1978 187 p refs

(AD-A078476; USAAEFA-77-09) Avail: NTIS

HC A09/MF A01 CSCL 01/3

The United States Army Aviation Engineering Flight Activity conducted a Preliminary Airworthiness Evaluation (PAE) of a UH-1H helicopter equipped with a Multiple Target Electronic Warfare System (MULTEWS) from 13 August through 2 December 1977. The evaluation was conducted at Edwards Air Force Base, California, and required 45 flights for a total productive flight time of 41 hours. The test program was terminated when the test aircraft sustained major damage during height-velocity testing. The addition of the MULTEWS equipment to the UH-1H airframe caused significant degradation in performance and handling qualities. Changes in the operator's manual should be made to reflect the changes in performance for MULTEWS configured aircraft. The MULTEWS installation also generally degraded the vibration characteristics of the UH-1H, increased structural loads, increased the maintenance workload, and degraded aircraft crashworthiness. The degradation in performance and handling qualities as well as the excessive vibrations and structural loads in the MULTEWS configured aircraft were attributed to the extremely high drag and turbulent wake of the externally mounted MULTEWS components. GRA

N80-19068# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.

DIGITAL COMPUTER SOLUTION OF AIRCRAFT LONGITUDINAL AND LATERAL DIRECTIONAL DYNAMIC CHARACTERISTICS Final Report

John M. Griffin, Robert B. Yeager, Larry B. Jordan, and David A. Ratino Jul. 1979 173 p refs Revised

(AD-A078672; AFFDL-TR-78-203) Avail: NTIS

HC A08/MF A01 CSCL 01/3

Two FORTRAN IV computer programs are presented for the solution of aircraft longitudinal and lateral-directional transfer function factors and dynamic characteristics. The longitudinal program solves for the three-degree-of-freedom dynamic characteristics (phugoid damping ratio and natural frequency, short period damping ratio and natural frequency, etc.) and the numerator factors of the alpha, u, theta, h, and vertical acceleration transfer functions. The lateral-directional program solves for the three-degree-of-freedom characteristics (Dutch roll damping ratio and natural frequency, roll and spiral mode time constants, etc.) and the numerator factors of the beta, phi, y, and lateral acceleration transfer functions. In addition, some time histories and specialized handling qualities parameters can be computed and printed out. The equations and their underlying assumptions are discussed. The two complete computer programs are shown, and the input, output, and program functions are discussed.GRA

N80-19069# Human Engineering Labs., Aberdeen Proving Ground, Md.

A STUDY OF THE CANOPY DESIGN FOR THE ADVANCED ATTACK HELICOPTER BY USE OF COMPUTER GRAPHICS Final Report

Christopher C. Smith Aug. 1979 137 p refs

(AD-A078291; HEL-TM-13-79) Avail: NTIS

HC A07/MF A01 CSCL 01/3

A package of computer programs has been developed for use in helicopter canopy design. The programs compute point-wise measures of three important design factors for the transparent surfaces of an attack helicopter canopy. These factors are: (1) the internal glare; (2) the external glint; and (3) the optical distortions exhibited by the canopy design. The programs have been applied to modifications in the present canopy design on the YAH-64 Advanced Attack Helicopter. The results suggest that reduced internal glare is possible with slight additional glint and distortion by displacing the side windows 4 inches from the plane of the frame vertices and rotating the axis of curvature of the top window by 90 degrees and displacing it 1.5 inches. GRA

N80-19070# Aeronautical Systems Div., Wright-Patterson AFB, Ohio. Flight Systems Engineering.

DEVELOPMENT OF A NORMALIZED PROBABILITY DISTRIBUTION FOR LATERAL LOAD FACTORS DUE TO AIRCRAFT GROUND TURNING Final Report

John W. Rustenburg Aug. 1979 41 p refs

(AF Proj. 139A)

(AD-A077047; ASD-TR-79-5037) Avail: NTIS

HC A03/MF A01 CSCL 01/3

It was desirable to determine the expected frequency of occurrence of lateral load factors due to aircraft ground turning maneuvers for a specified airplane service life. In order to accomplish this determination, published and unpublished ground operations data measured on a C-141-A, DC-9-15, 727-100, KC-135, and F-105D aircraft was condensed and evaluated, and used in the development of a normalized side load factor probability distribution for ground turning. The normalized distribution can be used to predict the expected lateral load factor spectrum due to ground turns for any aircraft. A subordinate analysis of KC-135 and FB-111A data provided a normalized probability distribution of lateral load factor applicable to taxiing and landing. GRA

N80-19071# Army Command and General Staff Coll., Fort Leavenworth, Kansas.

THE F-16 WILD WEASEL: A FEASIBILITY STUDY M.S. Thesis. Final Report
Byron L. Huff 8 Jun. 1979 63 p refs
(AD-A077050) Avail: NTIS HC A04/MF A01 CSCL 17/4

This study attempts to determine the feasibility of the Wild Weasel proposal being made by General Dynamics Corporation. The investigation covers the NATO threat, a brief history of the Wild Weasel; the capabilities of the current Wild Weasel (F-4G Phantom); the capabilities of the F-16 Wild Weasel; and a cost comparison of the F-16 and F-4G Wild Weasel aircraft. The investigation reveals that an advanced Wild Weasel is necessary to contend with the Soviet air defense system and to be compatible with near-future Allied fighter aircraft. GRA

N80-19072# Dynamics Research Corp., Wilmington, Mass. Systems Div.
APPLICATION OF THE ESTIMATION-BEFORE-MODELING (EBM) SYSTEM IDENTIFICATION METHOD TO THE HIGH ANGLE OF ATTACK/SIDESLIP FLIGHT OF THE T-2C JET TRAINER AIRCRAFT. VOLUME 3: IDENTIFICATION OF T-2C AERODYNAMICS STABILITY AND CONTROL CHARACTERISTICS FROM ACTUAL FLIGHT TEST DATA Final Report
Harold L. Stalford 11 Apr. 1979 254 p refs 3 Vol.
(Contract N62269-76-C-0342)
(AD-A079924; R-287U-Vol-3; NADC-76097-30-Vol-3; Rept-1273-Vol-3) Avail: NTIS HC A12/MF A01 CSCL 20/4

This volume presents the results of the application of the Estimation-Before-Modeling (EBM) System Identification Method to high angle of attack/sideslip flight test data of the T-2C Jet Trainer aircraft. Eighteen maneuvers consisting of over 600 seconds of 20 hertz data are processed. An extended Kalman-Bucy filter/Bryson-Frazier smoother is used in the first step to provide state estimates and measurement biases and scale factors. In the second step of the EBM method, the step-wise multiple linear regression technique and subspace modeling are used to identify detailed models of C sub y, C sub l, C sub n and C sub m. Partial results are given for C sub x and C sub z. The state and control derivatives of the identified model agree well with the wind tunnel model. Most of the identified dynamic derivatives compare well with the theoretically predicted value at low alpha and some compare well at high alpha. GRA

N80-19073# Dynamics Research Corp., Wilmington, Mass. Systems Div.
APPLICATION OF THE ESTIMATION-BEFORE-MODELING (EBM) SYSTEM IDENTIFICATION METHOD TO THE HIGH ANGLE OF ATTACK/SIDESLIP FLIGHT OF THE T-2C JET TRAINER AIRCRAFT. VOLUME 1: EXECUTIVE SUMMARY Final Report
Harold L. Stalford 12 Nov. 1979 61 p refs 3 Vol.
(Contract N62269-76-C-0342)
(AD-A080025; R-303U-Vol-1; NADC-76097-30-Vol-1; Rept-1273-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 20/4

This report (Volume 1) summarizes the development and application of the Estimation-Before-Modeling (EBM) method for aircraft parameter identification in the non-linear flight regime. The method utilizes a Two-step approach wherein model independent states, forces and moments are first estimated and then state and control dependent model parametes are obtained using a Stepwise Multiple Linear Regression (SLMR) approach. In the second step (SLMR) the angle of attack and sideslip and control input space for all available flight data is divided into small subspaces and force and moment coefficients are modeled within each subspace. The method is applied to both simulated and actual flight data for a T-2C jet trainer aircraft in the stall and post-stall flight regimes. Volumes 2 and 3 of this report present detailed description of the EBM method and its application. GRA

N80-19074# Naval Air Development Center, Warminster, Pa.
PROCEEDINGS OF A WORKSHOP ON V/STOL AIRCRAFT AERODYNAMICS, VOLUME 1
C. Henderson and M. F. Platzer May 1979 604 p refs Workshop held in Monterey, Calif., 16-18 May 1979
(AD-A079115) Avail: NTIS HC A99/MF A01 CSCL 01/3

This report contains the proceedings of the Workshop on V/STOL Aircraft Aerodynamics held at the Naval Postgraduate School on May 16 to 18, 1979. This workshop was sponsored by the Naval Air Development Center. The workshop participants included representatives from industry, government, universities and abroad. GRA

N80-19075# Foster-Miller Associates, Inc., Waltham, Mass.
ANALYSIS OF TRUNK FLUTTER IN AN AIR CUSHION LANDING SYSTEM Final Report
Ashok B. Boghani and Roger B. Fish Aug. 1979 114 p refs
(Contract F33615-78-C-3412; AF Proj. 2307)
(AD-A079008; WP-7819; AFFDL-TR-79-3102) Avail: NTIS HC A06/MF A01 CSCL 01/3

This report deals with explaining the occurrence of flutter in the Air Cushion Landing System (ACLS) trunks and suggesting means of suppressing it. Observations of flutter in several ACLS trunks indicate that the flutter is caused by the interaction between the trunk membrane and the flow at the trunk bottom. The flow creates a negative stiffness effect at the bottom which, if larger than the positive stiffness due to the tension of the trunk, induces flutter. A computer simulation based on this model succeeds in predicting the flutter observed in the XC-8A tests. Suggestions on solving the flutter problem are based on either modifying the trunk or modifying the flow. Computer simulations of several suggestions indicate that: (1) Providing a minimum gap; (2) Lowering the separation point; (3) chaning the operation conditions show good promise in suppressing the flutter. Two other suggestions, not simulated, which also have good potential for flutter suppression are: (1) Incorporating circular trunk, and (2) Incorporating hybrid trunk. GRA

N80-19076# Boeing Military Airplane Development, Seattle, Wash.
EASY ACLS DYNAMIC ANALYSIS, VOLUME 2. PART 2: COMPONENT COMPUTER PROGRAMS Final Report, Apr. 1977 - Jun. 1979
M. K. Wahi, G. S. Duleba, and P. R. Perkins Sep. 1979 296 p refs
(Contract F33615-77-C-3054; AF Proj. 2404)
(AD-A079803; AFFDL-TR-79-3105-Vol-2-Pt-2) Avail: NTIS HC A13/MF A01 CSCL 09/2

This volume contains a detailed description of the component subroutines and of other standard functions/subroutines which are used in the EASY dynamic analysis program. Macro-flow charts and some micro-flowcharts and listings are included. Sample output is included where appropriate. GRA

N80-19077# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
THRUST VECTORING TO ELIMINATE THE VERTICAL STABILIZER M.S. Thesis
Roy Edward LaFroth Dec. 1979 134 p refs
(AD-A079852; AFIT/GAE/AA/79D-9) Avail: NTIS HC A07/MF A01 CSCL 01/3

Root locus analysis techniques are used to design an active thrust vector control system to provide the directional stability for an F-111 without the vertical stabilizer. A linear analysis of the lateral-directional modes is performed for the aircraft both with and without the vertical stabilizer. The aircraft with the vertical stabilizer is used as a baseline. Computer histories for discrete atmospheric turbulence and a covariance analysis for random turbulence are used for the evaluation. It is found that the thrust vector control produces a response as good as or better than the baseline aircraft. Requirements for the thrust vector deflection and rate of deflection are generated. The lowest possible rate of deflection for acceptable flying qualities is shown to be 1 rad/sec. GRA

N80-19078# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
MINIMUM TIME TURNS WITH THRUST REVERSAL M.S. Thesis
Thomas L. Johnson Dec. 1979 77 p refs
(AD-A079851; AFIT/GAE/AA/79D-6) Avail: NTIS HC A05/MF A01 CSCL 01/2

The object of this study is to find the optimal trajectories and corresponding minimum turning times for a high performance aircraft with and without thrust reversal to perform a prescribed turn, and then to compare those trajectories and times to evaluate

the benefit of thrust reversal. Optimal control theory is applied to solve the minimum time to turn optimal control problem, using a suboptimal control problem approach and a second-order parameter-optimization method. The results of the study found that the suboptimal control approach was effective in solving the problem, that thrust reversal is beneficial in reducing turning time if the aircraft's initial velocity is above the corner velocity, and that thrust reversal is not beneficial in performing a minimum time turn without losing energy. GRA

N80-19079# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio. Aerospace Power Div.

AN ANALYTICAL AND EXPERIMENTAL STUDY OF AIRCRAFT HYDRAULIC LINES INCLUDING THE EFFECT OF MEAN FLOW Final Report, Jul. 1977 - Jul. 1979

John H. Pletcher, Jr. Nov. 1979 204 p refs
(AF Proj. 3145)
(AD-A079746; AFAPL-TR-79-2104) Avail: NTIS HC A11/MF A01 CSCL 01/3

A mathematical model of a fluid transmission line was developed which included the effect of mean flow coupling with oscillatory flow. The analysis centered on solving the nonhomogeneous confluent hypergeometric equation with complex parameters using an infinite series and evaluating the solution using Ward's method. Experiments were run using an aircraft hydraulic system. The frequency response, vibration displacement, and standing pressure hall wave were measured in a straight line and a line with bends for flow rates up to 9.5 gpm. A clampon transducer, which did not disturb the flow and could be easily moved, was used for the pressure measurements. In the absence of vibration the clampon transducer measurements were within 5% of readings taken with a conventional Statham in-line transducer. A sensitivity analysis showed the effect of small changes in geometry, temperature, steady-state pressure, fluid properties, entrained air content, and element volume. Using the new mathematical model, the attenuation and phase constant were calculated for hydraulic and air lines. Results compared well with experiment and published data. The new analysis and line model provide a means for the fluid systems engineer to accurately account for mean flow effects. GRA

N80-19080# Goodyear Aerospace Corp., Litchfield Park, Ariz.

THE FABRICATION AND TESTING OF PROTOTYPE UH-1 AIRCRAFT WINDSHIELDS MANUFACTURED WITH A SHEET INTERLAYER Final Report, 29 Mar. 1978 - 29 Jan. 1979

James O. Coast Aug. 1979 65 p refs
(Contract DAAG46-78-C-0008)
(AD-A077711; GERA-2378; USAAVRADCOM-TR-79-32; AMMRC-TR-79-50) Avail: NTIS HC A04/MF A01 CSCL 01/3

This program was conducted to determine the feasibility of fabricating helicopter windshields with a designated urethane sheet interlayer. Four sets of full-size UH-1 windshields consisting of two each of two different constructions were fabricated and tested. GRA

N80-19081# Lockheed-Georgia Co., Marietta.

AERODYNAMIC INVESTIGATION OF C-141 LEADING EDGE MODIFICATION FOR CRUISE DRAG REDUCTION, VOLUME 2 Final Report, Jun. 1977 - Sep. 1978

W. T. Blackerby and P. R. Smith Jun. 1979 319 p refs
(Contract F09603-77-A-0204)
(AD-A077688; LG78ER0233-Vol-2; AFFDL-TR-79-3059-Vol-2)
Avail: NTIS HC A14/MF A01 CSCL 01/3

A study of the aerodynamic design and high speed wind tunnel investigation of wing leading edge modifications for cruise drag reduction on the C-141 aircraft has been completed. Also investigated were the effects of a wing swept tip extension and trailing edge anti-drag bodies. These modifications were tested in the AEDC 16-Foot Transonic Facility, using a 0.044 scale C-141B model, to determine the effects on C-141 cruise aerodynamic characteristics and wing chordwise pressure distributions. Design of the leading edge modifications was based on the use of transonic wing theory, transonic airfoil theory and experience previously gained with a two-dimensional airfoil leading edge modification program. Force data results were analyzed to determine the effects on C-141 cruise drag, drag rise characteristics and cruise performance. Correlations were made with transonic theory using the measured chordwise pressure distributions. A fuel and cost savings evaluation was made of the selected leading edge configuration based on measured and predicted cruise performance improvements. GRA

N80-19082# Douglas Aircraft Co., Inc., Long Beach, Calif.

EVALUATION OF AIRCRAFT WINDSHIELD MATERIALS IN A SIMULATED SUPERSONIC FLIGHT ENVIRONMENT Final Report, May 1978 - Mar. 1979

J. B. Hoffman Jun. 1979 200 p refs
(Contract F33615-75-C-3105; AF Proj. 2202)
(AD-A078673; MDC-J7186; AFFDL-TR-79-3058) Avail: NTIS HC A09/MF A01 CSCL 01/3

A series of wind tunnel tests were conducted at Mach 2.4, 2.6 and 3.0 to determine material survivability and optical clarity for a variety of small, flat laminated and monolithic specimens of acrylic, urethane, glass, silicone and polycarbonate materials for potential use in the design of Mach 3.0 aircraft windshields. Twenty-seven specimens were tested to determine the material limitations and capabilities, which included an investigation of specific edge designs and the effect of edge structure on temperature distribution. The tests were conducted in a Mach 6 wind tunnel which utilized a shock generator to reduce the air stream to the desired flow across the outer surface of the specimens. The specimens were individually mounted in a pressurized box to provide a simulated cabin environment on their inner surface. Grid line photography was used to delineate inflight and permanent optical distortion. Material damage was evaluated and thermal gradients were documented. Prior to this test program, the aerodynamic effect of a Mach 2.4 through Mach 3.0 flight environment on transparent plastic and interlayer materials was unknown. The survival of these specimens demonstrated that laminated configurations consisting of acrylic/silicone/polycarbonate or urethane/urethane/polycarbonate, as well as glass/silicone/polycarbonate are viable candidates for aircraft windshields that would be exposed to a Mach 3.0 flight environment for short exposures. GRA

N80-19083# Sikorsky Aircraft, Stratford, Conn. Sikorsky Aircraft Div.

NADC ABC ROTOR MAPS Final Report

David T. Balsh 29 Jun. 1979 32 p refs
(Contract N62269-79-M-3221)
(AD-A078802; SER-69060) Avail: NTIS HC A03/MF A01 CSCL 01/3

This report is the formal documentation of the rotor performance maps and includes a description of the anticipated 1995 IOC rotor configuration on which the rotor maps are based and substantiation for the methodology used in the generation of the maps. The rotor maps themselves are presented in the appendix of this report in both HESCOMP transcript sheet form and in computer input code form, (the latter is a copy of the listing obtained from a set of punched computer cards which will have been presented to NAVAIRDEVCEN. GRA

N80-19084# RAND Corp., Santa Monica, Calif.

MEASURING TECHNOLOGICAL CHANGE IN JET FIGHTER AIRCRAFT Interim Report

William L. Stanley and Michael D. Miller Sep. 1979 124 p refs
(Contract F49620-77-C-0023)
(AD-A077393; RAND/R-2249-AF) Avail: NTIS HC A06/MF A01 CSCL 01/3

This report develops a technique to characterize the level of and change in jet fighter air vehicle technology. It complements other methods used to assess technological risks of new fighter concepts and to compare U.S. and foreign fighter technology. The technique uses multiple regression to relate time of appearance of an aircraft design to its level of technology. Resulting expressions measure performance consequences of technological advance in terms of such parameters as specific power, sustained load factor, Breguet range, and payload fraction. Measured in these terms, the rate of advance of U.S. fighter air vehicle technology is declining. The monetary cost of increasing the rate of advance could be very high. In the future, designers will have to balance increasingly difficult improvements in air vehicle technology against improvements in other technologies (such as

avionics or armament) that also enhance combat effectiveness. GRA

N80-19085# Systems Technology, Inc., Hawthorne, Calif.
DEVELOPMENT OF VTOL FLYING QUALITIES CRITERIA FOR LOW SPEED AND HOVER Final Report
Roger H. Hoh and Irving L. Ashkenas Dec. 1979 150 p refs
(Contract N62269-77-C-0278)
(AD-A079911; STI-TR-1116-1; NADC-77052-30) Avail: NTIS HC A07/MF A01 CSCL 01/2

A classification scheme has been developed to account for outside visual cues and cockpit displays in determining the required equivalent system forms for low speed and hover. Tentative criteria are presented in terms of a visibility scale which quantifies environmental conditions for the intended mission in a more fine-grained manner than simply specifying IMC or VMC. There are indications that rate and attitude systems may be used for partial IMC conditions but that a translational rate command system is required for low speed and hover in zero visibility. In general, most experiments indicate that advanced displays are not a substitute for augmentation. Tentative limiting conditions are defined for rate and attitude systems, but more data are required to define handling qualities for translational rate command systems. Since the existing data base is primarily oriented toward command/response characteristics, definition of the limiting conditions for turbulence and large discrete wind shears also requires more data. GRA

N80-19086# Systems Research Labs., Inc., Dayton, Ohio. Electronic Warfare Center.
DEVELOPMENT OF A VISUAL INSPECTION TECHNIQUE (OPTICAL ASSESSMENT OF AIRCRAFT TRANSPARENCIES)
Frank E. Ward, Anthony J. DeFrances, and Robert G. Eggleston (AMRL) Wright-Patterson AFB, Ohio AMRL Oct. 1979 129 p refs
(Contract F33615-77-C-0535; AF Proj. 2313)
(AD-A079369; AMRL-TR-79-67) Avail: NTIS HC A07/MF A01 CSCL 01/3

This work assessed the utility of different types of targets and psychophysical procedures for evaluating optical distortions induced by aircraft windscreens. Targets, both static and dynamic, were viewed through windscreens and the amount of distortion was judged by a magnitude estimation procedure. Judgements were analyzed by discriminant analysis to identify the targets that best facilitated good discrimination among windscreens. A psychophysical matching procedure was also evaluated. In some conditions, photographic representations of the distortion patterns were evaluated using the magnitude estimation procedures. The results of the work show that windscreen-induced distortion is a multidimensional attribute and is best evaluated by multiple inspection procedures. Specific static and dynamic targets are recommended for use in evaluating distortion. Correlations between physical measures of distortion and psychophysical judgments are reported as well as reliabilities for selected experiments. Suggestions for improvements and further work are included. GRA

N80-19087# Kay and Associates, Inc., Mount Prospect, Ill.
[AVIONICS LOGISTICS SUPPORT INCLUDING V/STOL, LAMPS, AND INSTRUMENT REPAIR] Final Report, 5 Dec. 1977 - 28 Aug. 1979
2 Nov. 1979 30 p refs
(Contract N60921-78-C-0014)
(AD-A077460) Avail: NTIS HC A03/MF A01 CSCL 01/3

This unclassified report contains information on the contractual effort of Kay and Associates, Inc. in support of the Naval Surface Weapons Center and the Naval Air Systems Command. The efforts encompassed a study concerning VSTOL vs LAMPS, Sea Based Air requirements, composition and configuration of future ship weapons, and screening of Source, Maintenance and Recoverability code changes. Additionally, this effort included the research and analysis of candidate instrument repair facilities with a view toward selecting specific instruments for various weapons systems for increased repair capability at the Intermediate level of Maintenance. GRA

N80-19088# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
A COMPUTER PROGRAM FOR ESTIMATING AIRCRAFT LANDING DISTANCE Interim Report, Aug. 1977 - Jul. 1979
Kervyn D. Mach Aug. 1979 39 p
(AF Proj. 3066)
(AD-A077169; AFAL-TR-79-2086) Avail: NTIS HC A03/MF A01 CSCL 01/2

This report describes a computer program which will estimate the runway length required to land a specified airplane. The program accepts inputs describing the aircraft gross weight, velocity, drag, and engine performance and computes the landing distance on specified runway surfaces. Sample results for a time-engine STOL transport are included. The computer program is described along with instructions for its use. GRA

N80-19089# National Technical Information Service, Springfield, Va.
REMOTELY PILOTED VEHICLES, VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, Nov. 1975 - Nov. 1979
Guy E. Habercom, Jr. Dec. 1979 270 p Supersedes NTIS/PS-78/1246; NTIS/PS-77/1143; NTIS/PS-76/1034; NTIS/PS75-876
(PB80-802119; NTIS/PS-78/1246; NTIS/PS-77/1143; NTIS/PS-76/1034; NTIS/PS-75/876) Avail: NTIS HC $30.00/MF $30.00 CSCL 01C

Operation of vehicles under remote guidance and control is investigated. Aircraft, drones, and extraterrestrial explorers are among the areas researched. This updated bibliography contains 262 abstracts, 35 of which are new entries to the previous edition. GRA

N80-19090# Advisory Group for Aerospace Research and Development, Paris (France).
DYNAMIC ENVIRONMENTAL QUALIFICATION TECHNIQUES
Nov. 1979 40 p refs Meeting held in Williamsburg, Va., Apr. 1979
(AGARD-R-682; ISBN-92-835-1342-8) Avail: NTIS HC A03/MF A01

Dynamic qualification test procedures are discussed with emphasis on determining the resistance of equipment to the effects of environments peculiar to military operations and requirements. For individual titles, see N80-19091 through N80-19093.

N80-19091# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.
APPLICATION OF MIL-STD-810C DYNAMIC REQUIREMENTS TO USAF AVIONICS PROCUREMENTS
J. H. Wafford *In* AGARD Dyn. Environ. Qualification Tech. Nov. 1979 11 p refs (For primary document see N80-19090 10-05)
Avail: NTIS HC A03/MF A01

The vibration requirements and the application of these requirements to the procurement of avionics equipment are discussed. Data obtained from external noise measurements and aerodynamically induced vibration are reported. R.C.T.

N80-19092# Messerschmidt-Boelkow G.m.b.H., Munich (West Germany). Unternehmensbereich Flugzeuge.
DYNAMIC ENVIRONMENTS AND TEST SIMULATION FOR QUALIFICATION OF AIRCRAFT EQUIPMENT AND EXTERNAL STORES
G. Haidl, C. Lodge (British Aerospace Aircraft Group, Warton, England), and H. Zimmermann (Vereinigte Flugtechnische Werke-Fokker G.m.b.H., Bremen, West Germany) *In* AGARD Dyn. Environ. Qualification Tech. Nov. 1979 13 p refs (For primary document see N80-19090 10-05)
Avail: NTIS HC A03/MF A01

Equipment within an aircraft was exposed to a wide variety of environments during ground and flight operations in order to determine its reliability and performance under conditions which will be encountered during its service life. Test specifications based upon real environments, but simplified for simulation, were

established. Significant observations and results are reported. R.C.T.

N80-19093# British Aerospace Aircraft Group, Bristol (England).
CIVIL AIRCRAFT EQUIPMENT ENVIRONMENT QUALIFICATION TECHNIQUES
B. W. Payne and G. H. F. Nayler *In* AGARD Dyn. Environ. Qualification Tech. Nov. 1979 10 p refs (For primary document see N80-19090 10-05)
Avail: NTIS HC A03/MF A01

The vibration testing of civil aircraft equipment is discussed. The environmental test levels that are existing in international requirements for civil aircraft are presented. R.C.T.

N80-19094# Advisory Group for Aerospace Research and Development, Paris (France).
PARAMETER IDENTIFICATION
Nov. 1979 353 p refs Lecture held in Delft, Netherlands, 29-30 Oct. 1979 and in London, 1-2 Nov. 1979
(AGARD-LS-104; ISBN-92-835-1340-1) Avail: NTIS HC A16/MF A01

The present state of the art of aircraft parameter identification techniques is reviewed. A critical appraisal of current methods developed and applied to the problems of analysis of flight test data in a number of NATO countries is given. Particular emphasis is placed on the practical aspects of aircraft parameter estimation to generate information useful for the flight test engineer. For individual titles, see N80-19095 through N80-19104.

N80-19095# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugmechanik.
AIRCRAFT PARAMETER IDENTIFICATION METHODS AND THEIR APPLICATIONS: SURVEY AND FUTURE ASPECTS
P. G. Hamel *In* AGARD Parameter Identification Nov. 1979 26 p refs (For primary document see N80-19094 10-05)
Avail: NTIS HC A16/MF A01

An overall view of the methods for the determination of aircraft flight mechanic parameters from flight tests and the problems associated with them is given. Technologies in the field of instrumentation, data handling, and data processing as well as improved methodologies for optimum control input design are covered. The application spectrum for parameter identification including aircraft handling qualities investigations and acceptance testing is emphasized. J.M.S.

N80-19096*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
IDENTIFICATION EVALUATION METHODS
Vladislav Klein *In* AGARD Parameter Identification Nov. 1979 21 p refs (For primary document see N80-19094 10-05)
Avail: NTIS HC A16/MF A01 CSCL 01C

Methods for airplane parameter estimation, the equation error method, output error method, and two advanced methods are presented and their basic properties described. The advanced methods include the maximum likelihood and extended Kalman filter method. For a better understanding of the estimation techniques a first-order scalar differential equation is used as a model of the system under test. Application of the methods to a general multivariable linear system is briefly outlined. A note on the parameter estimation in the frequency domain is also presented. Numerical examples along with the comparison of results from various methods are given. J.M.S.

N80-19097# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugmechanik.
PRACTICAL INPUT SIGNAL DESIGN
E. Plaetschke and G. Schulz (DFVLR, Oberpfaffenhofen, West Germany) *In* AGARD Parameter Identification Nov. 1979 19 p refs (For primary document see N80-19094 10-05)
Avail: NTIS HC A16/MF A01

The design of optimal inputs for identifying stability and control derivatives of the longitudinal and lateral motion of an aircraft is considered. First the purpose of input optimization, the constraints, and an overview of the literature is presented. Then two different procedures of input design are treated in more detail. Starting with investigations in the frequency domain the first method yields a multistep input signal, which fulfills specific spectral requirements. The second way of input design is based on the optimization of different measures of the Fisher information matrix, such as determinant or trace. Depending on the measure used, the designed signals differ with respect to their spectral composition. The discussed input signals, which were used in a flight test program, are compared with respect to the achieved accuracy of the identified stability and control derivatives. J.M.S.

N80-19098# National Aerospace Lab., Amsterdam (Netherlands).
ASPECTS OF FLIGHT TEST INSTRUMENTATION
J. H. Breeman, K. vanWoerkom, H. L. Jonkers, and J. A. Mulder *In* AGARD Parameter Identification Nov. 1979 22 p refs Prepared in cooperation with Technische Hogeschool, Delft, Netherlands (For primary document see N80-19094 10-05)
Avail: NTIS HC A16/MF A01

The design of the instrumentation system for parameter estimation tests is considered. Specifications of instrumentation for nonsteady flight testing are discussed along with general aspects and selection criteria of various transducer types. As practical examples parts of the high accuracy instrumentation systems developed for the determination of performance and stability and control characteristics for dynamic maneuvers are described. Problems of signal conditioning are discussed. J.M.S.

N80-19099# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
ANALYSIS OF AIRCRAFT PERFORMANCE STABILITY AND CONTROL MEASURES
J. A. MUlder, H. L. Jonkers, J. J. Horsten, J. H. Breeman, and J. L. Simons *In* AGARD Parameter Identification Nov. 1979 87 p refs Prepared in cooperation with National Aerospace Lab., Amsterdam (For primary document see N80-19094 10-05)
Avail: NTIS HC A16/MF A01

An overview is presented of the nonsteady flight test technique. Principal elements of this technique which is directed towards time efficient and accurate determination of performance characteristics as well as stability and control characteristics from measurements in nonsteady or quasi-steady flight, are: application of high quality flight test instrumentation systems; accurate reconstruction of the aircraft's motions; identification of nonlinear aerodynamic models; and calculation of performance, stability and control characteristics by correction of nonsteady or quasi-steady flight conditions towards prespecified nominal conditions. Main emphasis is on a tutorial exposition of the first three of these elements. In addition to the tutorial presentation some experimental results of various flight test programs are presented. J.M.S.

N80-19100*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
AIRCRAFT IDENTIFICATION EXPERIENCE
Kenneth W. Iliff *In* AGARD Parameter Identification Nov. 1979 35 p refs (For primary document see N80-19094 10-05)
Avail: NTIS HC A16/MF A01 CSCL 01C

Important aspects of estimating the unknown coefficients of the aircraft equations of motion from dynamic flight data are presented. The primary topic is the application of the maximum likelihood estimation technique. Basic considerations that must be addressed in the estimation of stability and control derivatives from conventional flight maneuvers are discussed. Some complex areas of estimation (such as estimation in the presence of atmospheric turbulence, estimation of acceleration derivatives, and analysis of maneuvers where both kinematic and aerodynamic coupling are present) are also discussed. R.E.S.

N80-19101# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugmechanik.
ROTORCRAFT IDENTIFICATION EXPERIENCE
J. Kaletka *In* AGARD Parameter Identification Nov. 1979 32 p refs (For primary document see N80-19094 10-05)
Avail: NTIS HC A16/MF A01

An overview of the identification of stability and control derivatives of the rotorcraft with respect to practical aspects

and applications is presented. First an introduction to the basic dynamics and control of helicopters is given. The helicopter characteristics causing difficulties in the identification are discussed. Measurement and sensor problems are also discussed. Approaches to overcome the difficulties are presented. Emphasis is placed on the following two key elements of the identification procedure: (1) the selection of adequate mathematical models and identifiable derivatives of the helicopter to isolate significant model effects; and (2) possibilities of increasing the information content of flight test data by appropriate system excitation and by multiple-run evaluations. Identification results obtained from simulated and flight test data of helicopters by applying different identification methods are presented. R.E.S.

N80-19102# Royal Aircraft Establishment, Farnborough (England). Flight Systems Dept.
IDENTIFICATION EXPERIENCE IN EXTREME FLIGHT REGIMES
A. Jean Ross *In* AGARD Parameter Identification Nov. 1979 15 p refs (For primary document see N80-19094 10-05)
Avail: NTIS HC A16/MF A01

A mathematical model for identifying stability and control derivatives of fighter aircraft is presented. The principles of the statistical approach are described. The treatment of the nonlinear terms is described and the tests which should be applied to assess the validity of the results are discussed. Selected results from investigations of manoeuvres at high angles of attack are presented to show the types of problems which can be solved, and to illustrate some effects of nonlinearities. R.E.S.

N80-19103# Institut de Mecanique des Fluides de Lille (France).
WIND TUNNEL AND FREE FLIGHT MODEL IDENTIFICATION EXPERIENCE
R. A. Verbrugge, W. Charon, and M. Marchand (DFVLR, Brunswick) *In* AGARD Parameter Identification Nov. 1979 33 p refs (For primary document see N80-19094 10-05)
Avail: NTIS HC A16/MF A01

An overview of different experimental techniques used for parameter identification based on dynamic model tests in wind tunnel or in free flight is presented. The specific domain of application is defined for each test technique. Particular aspects of semi-free and free model tests techniques in wind tunnel or laboratory experiences are described. Data processing from the collection until the application of identification procedure is discussed in terms of (1) the nature and quality of the information, (2) the data acquisition software, (3) the state vector elaboration, and (4) some specific filter aspects and evaluation methods. A set of results illustrate each particular point. A review of the present state of these techniques is given and future field of application is discussed. R.E.S.

N80-19104# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugmechanik.
CLOSED LOOP ASPECTS OF AIRCRAFT IDENTIFICATION
R. Koehler and K. Wilhelm *In* AGARD Parameter Identification Nov. 1979 24 p refs (For primary document see N80-19094 10-05)
Avail: NTIS HC A16/MF A01

Specific problems of system identification applied to highly augmented aircraft with respect to flying qualities assessment are discussed. An introduction to the influence of augmentation system on dynamic response and flying qualities is given. The application of parameter estimation techniques to control loop systems and problems of control loop identification and equivalent system modellization are discussed. R.E.S.

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N80-19105# Arinc Research Corp., Annapolis, Md.
AVIONICS INTERFACE DATA SUMMARIES: A-10A, EF-111A, F-4J, F-4G, F-15A, F-18A, F-111A, F-111E, F-111F, RF-4C
Oct. 1979 718 p refs
(Contract F33657-71-C-0567)
(AD-A077388; Rept-1750-01-2-2041) Avail: NTIS HC A99/MF A01 CSCL 01/3

This document is one of a series of reports that describe Avionics interfaces for various USAF aircraft. GRA

N80-19106# Naval Aerospace Medical Research Lab., Pensacola, Fla.
COMPARISON OF SPECIFICATIONS FOR HEAD-UP DISPLAYS IN THE NAVY A-4M, A-7E, AV-8A, AND F-14A AIRCRAFT
Lawrence H. Frank Nov. 1979 65 p refs
(ZF51524004; SF55525401)
(AD-A080047; NAMRL-SR-79-6) Avail: NTIS HC A04/MF A01 CSCL 01/4

This report provides, within a single document, a compendium of data on Head-Up Displays (HUDs) in U.S. Navy and U.S. Marine Corps aircraft that is germane to a Human Factors assessment of HUD design on pilot performance. The data in this report are compiled from current Naval Air Training and Operating Procedures Standardization (NATOPS) manuals and design specifications for each of the HUD units. Operational HUDs were found to vary dramatically from each other and the military specification for HUDs, MIL-D-81641(AS), with respect to symbology and formating. Furthermore, display clutter was reported by pilots to be a major problem. A comprehensive information processing evaluation of virtual image symbols and formating under dynamic conditions was recommended. Finally, none of the current Navy aircraft has a HUD control panel that complies to MIL-D-81641(AS), the military specification for HUDs. Pilots are required to bring their eyes back into the cockpit to ensure proper switch selection and, consequently, negate the primary purpose of maintaining a head-up mode. GRA

N80-19107# Bunker-Ramo Corp., Wright-Patterson AFB, Ohio.
FLIGHT PATH DISPLAYS Final Report, 15 Mar. - 1 Nov. 1978
Debra A. Warner Jun. 1979 106 p refs
(Contract F33615-78-C-3614; AF Proj. 2403)
(AD-A077181; AFFDL-TR-79-3075) Avail: NTIS HC A06/MF A01 CSCL 01/3

Aircraft display technology has advanced to the state where the flight path display--an integrated format on which both the vertical and horizontal path are graphically represented--is feasible. This report researches efforts made to design flight paths for use in both fixed wing and rotary wing aircraft. Results from comparison evaluations of flight path and non-flight path displays are discussed and conclusions drawn with respect to desirable display symbology. A hypothetical flight path display designed as a result of the findings in the referenced studies is proposed for future testing and evaluation. GRA

N80-19814# General Research Corp., Santa Barbara, Calif.
VERIFICATION AND VALIDATION OF AVIONIC SIMULATIONS
Sabina H. Saib *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 6 p (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

N80-19832# Royal Aircraft Establishment, Farnborough (England).
SIMULATION OF A NIGHT VISION SYSTEM FOR LOW LEVEL HELICOPTER OPERATIONS
J. N. Barrett *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 24 p (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

N80-19837# British Aerospace Aircraft Group, Brough (England).
THE ROLE OF THE AIRCRAFT MODEL IN AVIONIC SYSTEMS SIMULATION
J. D. Bannister and R. Hicks *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan.

1980 14 p refs (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

N80-19838# Battelle Columbus Labs., Ohio.
AVIONICS EVALUATION PROGRAM: SIMULATION MODELS FOR THE EFFECTIVENESS ANALYSIS OF AVIONICS
David Welp, Ken Almquist, and Larry Rainey *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 4 p Prepared in cooperation with AFAL, Wright-Patterson AFB, Ohio (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

N80-19839# British Aerospace Dynamics Group, Bristol (England).
SIMULATION FOR WHOLE LIFE DEVELOPMENT
R. J. Morrow and R. Richards *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 11 p refs (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

N80-19840# Air Force Avionics Lab., Wright-Patterson AFB, Ohio.
A SIMULATION SUPPORT SYSTEM, THE DEVELOPMENT TOOL FOR AVIONIC SYSTEMS AND SUBSYSTEMS
John C. Ostgaard *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 11 p refs (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N80-19108*# California Univ., Berkeley.
TURBULENCE, COMBUSTION, POLLUTANT, AND STABILITY CHARACTERIZATION OF A PREMIXED, STEP COMBUSTOR
A. T. Ganji and R. F. Sawyer Washington NASA Jan. 1980 215 p refs
(Grant NsG-3028)
(NASA-CR-3230) Avail: NTIS HC A10/MF A01 CSCL 21E

A two dimensional combustion tunnel was constructed to study a lean premixed turbulent propane/air flame stablized behind a rearward facing step. Studied were: (1) the existence and importance of large coherent structures in turbulent reacting and nonreacting free shear layers behind the steps; (2) the effect of inlet temperature and reference velocity on combustion efficiency; (3) CO, NO2 and NO sub x production in the flame; and (4) the blowout and upstream propagation of the flame. In the ranges studied, the large coherent structures dominsted both the reacting and the nonreacting free shear layers behind the step. The growth of the vortices and the propagation of the flamer were intimately linked. Vortex pairing was observed to be one of the mechanisms for introduction of fresh reactants into the shear layer and growth of the shear layer. Probe composition measurements of the flame showed that, in the recirculation zone, the reaction was above 99 percent complete, CO and unburnt hydrocarbons were above the equilibrium level NO sub x concentration was far below the equilibrium level and NO2 comprised a negligible fraction of NO sub x. R.E.S.

N80-19109# Calspan Advanced Technology Center, Buffalo, N.Y. Aerodynamic Research Dept.
TESTS OF AN IMPROVED ROTATING STALL CONTROL SYSTEM ON A J-85 TURBOJET ENGINE Final Technical Report, May 1976 - May 1979
Gary R. Ludwig Wright-Patterson AFB, Ohio AFAPL Aug. 1979 76 p refs
(Contract F33615-76-C-2092; AF Proj. 3066)
(AD-A077704; CALSPAN-XE-5933-A-104; AFAPL-TR-79-2060) Avail: NTIS HC A05/MF A01 CSCL 21/5

This report presents the results of testing a fast-acting rotating stall control system on a J-85 turbojet engine under sea level static conditions, both with and without inlet distortion. The control is an electronic feedback control system which uses unsteady pressure signals produced by pressure sensors within the compressor to detect incipient rotating stall and provide a correction signal when such a condition occurs. On the J-85 engine, the correction signal is used to drive a fast-response hydraulic actuator which operates intermediate stage compressor bleed doors and inlet guide vane flaps. The performance of the stall control was tested by closing the bleed doors until rotating stall occurred or until the control anticipated stall and held the bleed doors open. The tests showed that the control is capable of anticipating stall before it occurs and keeping the engine completely clear of stall at speeds up to 80 percent of design speed. No tests were performed above 80 percent of design because opening the bleed doors at such speeds might aggravate the stall rather than clear it. GRA

N80-19110*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.
PRELIMINARY STUDY OF VTO THRUST REQUIREMENTS FOR A V/STOL AIRCRAFT WITH LIFT PLUS LIFT/CRUISE PROPULSION
George E. Turney and John L. Allen Feb. 1980 23 p refs
(NASA-TM-81429; E-351) Avail: NTIS HC A02/MF A01 CSCL 21E

A preliminary assessment was made of the VTO thrust requirements for a supersonic (Type B) aircraft with a Lift plus Lift/Cruise propulsion system. A baseline aircraft with a takeoff gross weight (TOGW) of 13 608 kg (30,000 lb) was assumed. Pitch, roll, and yaw control thrusts (i.e., the thrusts needed for aircraft attitude control in the flight hover mode) were estimated based on a specified set of maneuver acceleration requirements for V/STOL aircraft. Other effects (such as installation losses, suckdown, reingestion, etc.), which add to the thrust requirements for VTO were also estimated. For the baseline aircraft, the excess thrust required for attitude control of the aircraft during VTO and flight hover was estimated to range from 36.9 to 50.9 percent of the TOGW. It was concluded that the total thrust requirements for the aircraft/propulsion system are large and significant. In order to achieve the performance expected of this aircraft/propulsion system, reductions must be made in the excess thrust requirements. J.M.S.

N80-19111*# National Aeronautics and Space Administration, Washington, D. C.
STRUCTURAL ANALYSIS OF HOLLOW BLADES: TORSIONAL STRESS ANALYSIS OF HOLLOW FAN BLADES FOR AIRCRAFT JET ENGINES
A. Ogawa, Y. Sofue, and T. Isobe Oct. 1979 25 p refs Transl. into ENGLISH of "Chukuyoku no Kozokaiseki," Rept. NAL-TR-533 Natl. Aerospace Lab., Tokyo, May 1977, 15 p Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75718; NAL-TR-533) Avail: NTIS HC A02/MF A01 CSCL 21E

A torsional stress analysis of hollow fans blades by the finite element method is presented. The fans are considered to be double circular arc blades, hollowed 30 percent, and twisted by a component of the centrifugal force by the rated revolution. The effects of blade hollowing on strength and rigidity are discussed. The effects of reinforcing webs, placed in the hollowed section in varying numbers and locations, on torsional rigidity and the convergence of stresses, are reported. A forecast of the 30 percent hollowing against torsional loadings is discussed. A.W.H.

N80-19112# Royal Aircraft Establishment, Farnborough (England).
CONTRIBUTION OF PHOTOELASTIC ANALYSIS TO THE STUDY OF TURBO-ENGINE COMPONENTS
J. L. Guillo Nov. 1979 34 p Transl. into ENGLISH from

AGARD Conf. Proc. No. 248, Apr. 1979
(BR71985; RAE-Lib-Trans-2028) Avail: NTIS HC A03/MF A01

Photoelastic measurements which determine the local stress concentrations, and the method of stress freezing in the analysis of three dimensional stress states are discussed in relation to jet engine components. The means employed for the preparation and carrying out of freezing operations and the equipment used in the operation are described. Examples of applying photoelastic measurement and stress freezing operations are presented. Emphasis is placed on the determination of the stress intensity factor which governs crack propagation under cyclic stress application. A.W.H.

N80-19113*# Pratt and Whitney Aircraft Group, East Hartford, Conn. Commercial Products Div.

CORE COMPRESSOR EXIT STAGE STUDY. 1: AERODYNAMIC AND MECHANICAL DESIGN

E. A. Burdsall, E. Canal, Jr., and K. A. Lyons Sep. 1979 128 p ref
(Contract NAS3-20578)
(NASA-CR-159714; PWA-5561-55) Avail: NTIS HC A07/MF A01 CSCL 21E

The effect of aspect ratio on the performance of core compressor exit stages was demonstrated using two three stage, highly loaded, core compressors. Aspect ratio was identified as having a strong influence on compressors endwall loss. Both compressors simulated the last three stages of an advanced eight stage core compressor and were designed with the same 0.915 hub/tip ratio, 4.30 kg/sec (9.47 lbm/sec) inlet corrected flow, and 167 m/sec (547 ft/sec) corrected mean wheel speed. The first compressor had an aspect ratio of 0.81 and an overall pressure ratio of 1.357 at a design adiabatic efficiency of 88.3% with an average diffusion factor or 0.529. The aspect ratio of the second compressor was 1.22 with an overall pressure ratio of 1.324 at a design adiabatic efficiency of 88.7% with an average diffusion factor of 0.491. R.C.T.

N80-19114# American Inst. of Aeronautics and Astronautics, New York.

THE 4TH INTERNATIONAL SYMPOSIUM ON AIR BREATHING ENGINES

Apr. 1979 425 p refs Symp. held at Lake Buena Vista, Orlando, Fla., 1-6 Apr. 1979
(Grant N00014-77-G-0069)
(AD-A078956) Avail: NTIS HC A18/MF A01 CSCL 21/5

Partial Contents: Inlet Flow Distortion; Operations/Cost/Maintenance; Aeroelasticity/Vibrations; Systems Integration; Fuels and Combustion; 3 Dimensional Flow and Boundary Layer/Shock Separation; Component Developements Compressors; and Ramjets. GRA

N80-19115# Calspan Advanced Technology Center, Buffalo, N.Y. Aerodynamic Research Dept.

BASIC STUDIES OF ROTATING STALL IN AXIAL FLOW COMPRESSORS Final Report, Jun. 1976 - Apr. 1979

Gary R. Ludwig and Joseph P. Nenni Sep. 1979 150 p refs
(Contract F33615-76-C-2092; AF Proj. 3066)
(AD-A077690; CALSPAN-XE-5933-A-105; AFAPL-TR-79-2083) Avail: NTIS HC A07/MF A01 CSCL 21/5

This report presents the results of a theoretical and experimental program aimed at obtaining a sufficient understanding of the rotating stall phenomena such that its onset and properties can be predicted under a wide set of circumstances. The theoretical research covers the development of two dimensional stability theories for compressible flows and the progress towards the development of a three dimensional theory for incompressible flow. The experimental work, performed in an annular cascade facility, studied the effects of rotorstator interference both on the steady-state performance of the blade rows and on rotating stall. The influence of circumferential distortion on the rotating stall boundary for the stage was also determined. Comparisons are made between the experimental results and the predictions of a two dimensional rotating stall stability theory which had been developed previously for incompressible flows. GRA

N80-19116# Calspan Advanced Technology Center, Buffalo, N.Y. Aerodynamic Research Dept.

AERODYNAMIC AND ACOUSTIC INVESTIGATIONS OF AXIAL FLOW FAN AND COMPRESSOR BLADE ROWS, INCLUDING THREE-DIMENSIONAL EFFECTS Final Report, 1 Jun. 1976 - 31 Mar. 1979

Gregory F. Homicz, John A. Lordi, and Gary R. Ludwig Aug. 1979 145 p refs
(Contract F33615-76-C-2092; AF Proj. 3066)
(AD-A077712; CALSPAN-XE-5933-A-103; AFAPL-TR-79-2061) Avail: NTIS HC A07/MF A01 CSCL 21/5

This report presents the results of a program designed to study the influence of three-dimensional effects on the aerodynamics and acoustics of axial flow fans and compressors. To avoid numerical solutions of the full nonlinear three-dimensional equations, a linearized analysis is employed. This is first applied to the determination of the steady loading on a three-dimensional annular blade row with a prescribed chamber line in inviscid compressible flow. The blades are represented by pressure dipole singularities in a lifting-surface formulation, and a collection procedure is presented for inverting the resulting integral equation. Comparisons are presented between the present results and those of two-dimensional strip theory and an inverse three-dimensional theory. Next the analysis is extended to the case of unsteady flow through the rotor, such as might be caused by inflow distortion or blade flutter. The integral equation for this case is somewhat more complicated, but appears to be solvable by a suitable extension of the procedure developed in the steady problem. Finally, further comparisons are presented between a theoretical model of rotor-stator interaction noise developed under a previous program and a current series of measurements made in an annular cascade facility. GRA

N80-19117# Systems Control, Inc., Palo Alto, Calif.

VARIABLE CYCLE ENGINE MULTIVARIABLE CONTROL SYNTHESIS: CONTROL STRUCTURE DEFINITION Interim Report, 1 Sep. 1977 - 31 Aug. 1978

Stephen M. Rock and Ronald L. DeHoff Feb. 1979 174 p refs
(Contract F33615-77-C-2096; AF Proj. 3066)
(AD-A078670; AFAPL-TR-79-2043) Avail: NTIS HC A08/MF A01 CSCL 21/5

The variable cycle aircraft turbine engine, GE23-JTDE, represents a prototype of future multimode propulsion plants. It is a sophisticated design of highly variable geometry and multiple control inputs. To control this engine, a large number of engine variables must be sensed. These include engine pressures, temperatures, rotor speeds, and airframe and inlet commands. A controller for this engine must therefore be multivariable (i.e., manipulating large numbers of input and output variables) and multifunctional (i.e., perform, in addition to control logic, data conditioning and fault diagnosis). The development of such a full authority digital electronic controller must utilize demonstrated multivariable design techniques to integrate adequately these complex system functions. A preliminary design of a controller for this variable cycle engine is described. It is implementable on a small digital computer (less than 16K words of storage), and is modular in design (subroutine format). Specific controller functions of transient regulation, steady state regulation, trajectory generation, signal processing, and fault detection and accommodation are incorporated in a way which allows experimentation with different techniques for each function without affecting the overall structure. Promising techniques for implementing each function are discussed. GRA

N80-19118# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.

NOVEL CERAMIC TURBINE ROTOR CONCEPTS Final Technical Report, 22 Sep. 1978 - 22 May 1979

L. J. Stoffer Wright-Patterson AFB, Ohio AFAPL Sep. 1979 93 p refs
(Contract F33615-78-C-2041; AF Proj. 3066)
(AD-A078669; R79AEG527; AFAPL-TR-79-2074) Avail: NTIS HC A05/MF A01 CSCL 21/5

A novel design concept for a ceramic turbine rotor has been studied in detail for a non-man-rated, limited-life gas turbine engine application. The feature of the design involves keeping

the rotating ceramic components in a compression state at all turbine operating conditions. An air-cooled composite material containment hoop is utilized at the outer diameter of ceramic air-cooled fins which support ceramic turbine blades in compression against a radially compliant wheel. The design study of this Compression Structured Ceramic Turbine Rotor included detailed material, heat transfer, and 3-D stress analyses. The study effort also looked at the operational limits of the design and a performance and economic analysis comparison to a baseline metal design. Conclusions and recommendations for future development are also presented in this report. GRA

N80-19119# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
EVALUATION OF FUEL CHARACTER EFFECTS ON J79 ENGINE COMBUSTION SYSTEM Final Technical Report, 7 Jun. 1977 - 31 Aug. 1978
C. C. Gleason, T. L. Oller, M. W. Shayerson, and D. W. Bahr Jun. 1979 198 p refs
(Contract F33615-77-C-2042; AF Proj. 3048)
(AD-A078440; R79AEG321; AFAPL-TR-79-2015; CEEDO-TR-79-06) Avail: NTIS HC A09/MF A01 CSCL 21/5

Results of a program to determine the effects of broad variations in fuel properties on the performance, emissions, and durability of the J79-17A turbojet engine combustion system are presented. Combustor tests conducted at engine idle, takeoff, subsonic cruise, supersonic dash, cold day ground start, and altitude relight operating conditions with 13 different fuels are described. The test fuels covered a range of hydrogen contents (12.0 to 14.5 percent), aromatic type (monocyclic and bicyclic), initial boiling point (285 to 393 K), final boiling point (552 to 679 K) and viscosity (0.83 to 3.25 mm2/s at 300 K). At high power operating conditions, fuel hydrogen content was found to be a very significant fuel property with respect to linear temperature, flame radiation, smoke, and NO sub x emission levels. Carbon monoxide and HC emissions were very low at these conditions with all of the fuels. At engine idle operating conditions, CO, HC, and NO sub x emission levels were found to be independent of fuel hydrogen content, but a small effect of fuel volatility and/or viscosity was found. At cold day ground start conditions (to 329 K) lightoff was obtained with all fuels, but the required fuel-air ratio increased with the more viscous fuels. At altitude conditions, the current engine relight limits with JP-4/JP-5 fuel were essentially met or exceeded with all of the JP-4 or JP-8 based fuel blends. However, a very significant reduction in altitude relight capability was found when a No. 2 diesel fuel was tested. GRA

N80-19120# Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Government Products Div.
INVESTIGATION OF FAN BLADES SHROUD MECHANICAL DAMPING
Donald A. Rimkunas and H. Murray Frye Jun. 1979 79 p refs
(Contract F33615-77-C-2086; AF Proj. 2307)
(AD-A078439; PWA-FR-11065; AFAPL-TR-79-2054) Avail: NTIS HC A05/MF A01 CSCL 21/5

This program was conducted to investigate the effect of dry friction damping at the shroud interfaces on the structural dynamic characteristics of shrouded fan blades typical of current high performance jet engines. An analytical definition of the loads generated at the shroud faces for a general stick-slip condition was developed. The analytical load description includes the elastic case of a stuck or locked shroud as well as the case of a slipping shroud. These loads were used in a non-linear steady-state vibration analysis of the shrouded blade. Controlled vibration testing of the first-stage fan blade with a trailing edge shroud of a YF100 (prototype) turbofan engine was conducted. The blade was tested with variable shroud restraints to simulate the full range of boundary conditions from freely slipping to fully locked, including the intermediate condition of micro-slipping. The testing of the blade with a freely slipping shroud was inconclusive because of repeatability problems. Good agreement was found between the nonlinear analysis and test data for the stuck and micro-slip boundary conditions. GRA

N80-19121# Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Government Products Div.
REJUVENATION OF TURBINE BLADE MATERIAL BY THERMAL TREATMENT Final Report, 15 Apr. 1978 - 15 Oct. 1978
Mike D. Ross, Gary T. Bennett, and Dennis C. Stewart Jul. 1979 98 p refs
(Contract F33615-76-C-5208; AF Proj. 7351)
(AD-A077527; FR-10961; AFML-TR-79-4032) Avail: NTIS HC A05/MF A01 CSCL 21/5

This report describes a two phase program designed to investigate the feasibility of applying thermal treatments at some fraction of a turbine blade's life to heal accumulated fatigue and creep damage thereby extending useful blade life. Test evaluations were conducted on cast test bars of two nickel-base superalloys: conventionally cast (CC) In 100 alloy and directionally solidified (DS) MAR-M200 Hf. In Phase 1, creep testing of cast specimens was used to select suitable rejuvenation heat treatments based upon recoverable creep life and strain. The effect of creep strain and subsequent rejuvenation on minimum mechanical property requirements and the maximum recoverable creep strain was also determined. In addition, the use of eddy current inspection was investigated as a method to provide specific NDI criteria for selection of components suitable for rejuvenation processing. The Phase 2 effort included determinations of the effectiveness of rejuvenation heat treatments in recovering repeated creep strain damage and in recovering specific amounts of low-cycle and high-cycle fatigue life. In addition, the effects of rejuvenation heat treatments in recovering cumulative creep/fatigue strain damage was determined. Finally an assessment was made of the technical and economic feasibility for extending useful turbine blade life by rejuvenation thermal treatments. GRA

N80-19122# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
AN ANALYSIS AND SYNTHESIS OF ENGINE CONDITION MONITORING SYSTEMS M.S. Thesis
Jack W. Chapman, Jr. and Charles L. Page, Jr. Sep. 1979 138 p refs
(AD-A077531; AFIT-LSSR-27-79B) Avail: NTIS HC A07/MF A01 CSCL 21/5

Engine condition monitoring systems have been developed to assist flight line maintenance activities and aid in the transition of aircraft engine maintenance philosophy from that of maximum operating time to reliability centered or on condition maintenance. This study includes a comprehensive review of past, current, and proposed Air Force applications of turbine engine monitoring systems to describe the major features of TEMS. Engine performance data output from TEMS to the various engine management functions are analyzed. The authors conclude that TEMS data and the existing or proposed engine management systems are not directly compatible. Moreover, the analysis indicates that implementation of TEMS and an on condition maintenance policy would require a greatly expanded data base to accomplish the required engine management record keeping, monitoring, and forecasting tasks. Several recommendations are offered for interfacing TEMS with the engine management systems. Areas for further research are suggested. GRA

N80-19123# AiResearch Mfg. Co., Phoenix, Ariz.
DEMONSTRATION PROGRAM FOR A FLEXIBLE DUCT VALVE FOR RAMJET ENGINE FUEL CONTROLS Final Report, 15 Nov. 1978 - 28 Feb. 1979
James S. Roundy 14 Sep. 1979 67 p refs
(Contract N62269-77-C-0352)
(AD-A078529; AiResearch-41-2226; NADC-77136-60) Avail: NTIS HC A04/MF A01 CSCL 21/5

A demonstration program was conducted to develop a flex duct-type metering valve for use in the fuel control of ramjet engines for Navy missiles. This type valve has inherent advantages of simplicity, low cost, and high reliability that make it particularly attractive for this application. This type valve functions best when the leakage flow from the metering gap is bypassed back upstream of the fuel pump. GRA

N80-19124# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.

ADVANCED INFRARED SIGNATURE PREDICTION PROGRAM. SPECTRAL CALCULATION OF RADIATION FROM A TURBINE PROPULSION SYSTEM AS INTERCEPTED BY AN OBSERVER (SCORPION). VOLUME 3: ANALYSIS
M. E. Wilton Nov. 1979 235 p refs
(Contract N00140-76-C-1072)
(AD-A078436; R78AEG314) Avail: NTIS HC A11/MF A01 CSCL 17/5

Current infrared-guided missiles can detect and destroy aircraft from relatively long distances. Future IR missiles will be even more sensitive and destructive. The engine designer must select cycles and engine configurations that present as small a target as possible to these missile threats. To accomplish this, he must know the IR emissions from the aircraft and be able to judge the success of schemes to suppress these emissions. Measurements are invaluable in determining the IR emissions for selected aircraft situations but cannot possibly be made for all aircraft and for all situations. This is obviously true in the engine design phase. In addition, understanding of the fundamental sources of these emissions is essential to the invention or evaluation of new suppression concepts. An accurate prediction pool, therefore, is vital to the process of reducing the vulnerability of an aircraft to IR-guided missiles. As a supplier of jet engines for military aircraft, the General Electric Company has developed a series of computer programs to predict the IR signatures and vulnerability of IR-guided missiles. The SCORPIO-N computer program presented in this report is the latest in the series. It is an outgrowth of the SCORPIO-IIIA program (Reference 1) and the SPRITE program (Reference 2) with improvements to the plume module which permit studies of truly three-dimensional flow fields. GRA

N80-19125# Vought Corp., Dallas, Tex.
POWER SYSTEM CONTROL STUDY. PHASE 1: INTEGRATED CONTROL TECHNIQUES Interim Report, 1 Jul. 1978 - 15 Jun. 1979
D. E. Lautner, A. J. Marek, and J. R. Perkins Wright-Patterson AFB, Ohio AFAPL Jun. 1979 240 p refs
(Contract F33615-78-C-2018; AF Proj. 3145)
(AD-A078629; AFAPL-TR-79-2084) Avail: NTIS HC A11/MF A01 CSCL 01/3

This report documents the Phase 1 results of a two phase study program which addresses the integration of advanced power system control technologies into a reliable and fault tolerant system. The advanced control technologies integrated include electric engine start, automatic load management, microprocessor control implementations, design techniques for providing 'no-gap' power and an all 'solid state' electric power distribution system. Electric system performance requirements are established and preliminary designs of an integrated 'baseline' control system for single and multiengine aircraft for the 1990 operational time period are presented. Finally, stability analysis requirements and procedures are established for each of the two designs. During Phase 2, detail design of the power control system will be completed and a stability analysis will be conducted. GRA

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N80-19126*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
APPLICATION OF THE CONCEPT OF DYNAMIC TRIM CONTROL TO AUTOMATIC LANDING OF CARRIER AIRCRAFT
G. Allan Smith and George Meyer Apr. 1980 87 p refs
(NASA-TP-1512; A-7801) Avail: NTIS HC A05/MF A01 CSCL 01C

The results of a simulation study of an alternative design concept for an automatic landing control system are presented. The alternative design concept for an automatic landing control system is described. The design concept is the total aircraft flight control system (TAFCOS). TAFCOS is an open loop, feed forward system that commands the proper instantaneous thrust, angle of attack, and roll angle to achieve the forces required to follow the desired trajector. These dynamic trim conditions are determined by an inversion of the aircraft nonlinear force characteristics. The concept was applied to an A-7E aircraft approaching an aircraft carrier. The implementation details with an airborne digital computer are discussed. The automatic carrier landing situation is described. The simulation results are presented for a carrier approach with atmospheric disturbances, an approach with no disturbances, and for tailwind and headwind gusts. A.W.H.

N80-19127*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FLIGHT EVALUATION OF CONFIGURATION MANAGEMENT SYSTEM CONCEPTS DURING TRANSITION TO THE LANDING APPROACH FOR A POWERED-LIFT STOL AIRCRAFT
James A. Franklin and Robert C. Innis Mar. 1980 32 p refs
(NASA-TM-81146; A-7957) Avail: NTIS HC A03/MF A01 CSCL 01C

Flight experiments were conducted to evaluate two control concepts for configuration management during the transition to landing approach for a powered-lift STOL aircraft. NASA Ames' augmentor wing research aircraft was used in the program. Transitions from nominal level-flight configurations at terminal area pattern speeds were conducted along straight and curved descending flightpaths. Stabilization and command augmentation for attitude and airspeed control were used in conjunction with a three-cue flight director that presented commands for pitch, roll, and throttle controls. A prototype microwave system provided landing guidance. Results of these flight experiments indicate that these configuration management concepts permit the successful performance of transitions and approaches along curved paths by powered-lift STOL aircraft. Flight director guidance was essential to accomplish the task. Author

N80-19128# Systems Research Labs., Inc., Dayton, Ohio.
HANDLING QUALITY REQUIREMENTS FOR ADVANCED AIRCRAFT DESIGN LONGITUDINAL MODE Final Report, Feb. 1977 - Aug. 1978
Ralph H. Smith and Norman D. Geddes Aug. 1979 185 p refs
(Contract F33615-77-C-3011; AF Proj. 2090)
(AD-A077858; AFFDL-TR-78-154) Avail: NTIS HC A09/MF A01 CSCL 01/3

This report considers the problem of developing handling qualities specifications for aircraft with nonclassical dynamic response to control. These include closed loop flight control system effects on basic airframe dynamics, direct force control applications, digital flight control, integrated fire-flight control, and integrated display-flight control. Only the longitudinal mode is considered. Elements of classic pilot-vehicle analysis methodology are distilled against a theoretical framework for the prediction of pilot opinion rating to develop a simplified and practical approach to handling qualities prediction that is directly applicable to the development of specificatons for aircraft flight control system design. The most important effects of motion cues on handling qualities are included within this model. The methods proposed for the prediction and correlation of handling qualities are validated against the largest and most appropriate base of handling qualities data available; the agreement is nearly 100 percent. GRA

N80-19129# Naval Academy, Annapolis, Md.
MICROPROCESSOR CONTROL OF LOW SPEED V/STOL FLIGHT Final Report, 1978 - 1979
Robert V. Walters 8 Jun. 1979 203 p refs
(AD-A077661; USNA-TSPR-100) Avail: NTIS HC A10/MF A01 CSCL 01/4

This paper considers the design of an improved three-axis stability augmentation system (SAS) for the AV-8B Advanced Harrier V/STOL aircraft using microprocessor-based digital control. It focuses on improving the handling qualities of the airplane through SAS redesign in the low speed flight regime. Particular attention is paid to the so-called 'weather-cocking' instability encountered in transition (hover to/from conventional) flight. There was a dearth of information about the Harrier's flight characteristics until the development of MCAIR's X22A AV-8B mathematical

model, which yielded a set of linearized stability derivatives for the aircraft. The first step toward improvement of the AV-8B SAS requires the use of these coefficients in the development of an analog/hybrid model of both the aircraft itself and of the unmodified SAS. The controller design uses digital state feedback control to relocate the system closed loop poles. It is concluded that this method of control represents a valid approach to the final solution of the Harrier's stability and control problems and that this controller design concept might be applied to future aerospace vehicles. GRA

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

N80-19130# Federal Aviation Administration, Washington, D. C.
NONDESTRUCTIVE EVALUATION OF AIRPORT PAVEMENTS. VOLUME 2: OPERATIONAL MANUAL FOR PAVBEN PROGRAM AT TCC Final Report
David Yang Sep. 1979 123 p
(Contract DOT-FA77WA-3964)
(AD-A079495; FAA-RD-78-154-Vol-2) Avail: NTIS HC A06/MF A01 CSCL 01/5

The operation of PAVBEN program is presented. The job inputs consist of: (1) field data; (2) types of existing pavements; (3) facility classifications; (4) demand forecast and (5) local cost values. The default system contains all design data for: (1) 15 air transports; (2) 9 FAA regional cost values; (3) 8 types of pavement design; (4) 22 layer components; (5) 20 types of existing pavement and (6) universal mechanistic design model. The major outputs will be: (1) NDT inventory file; (2) present functional life; (3) computed engineering data; (4) pavement thickness and cost data and (5) cost/benefit analysis for four new pavements, three overlays and three keel constructions. The program is written in a high level language FORTRAN IV. R.E.S.

N80-19131*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A THEORETICAL ANALYSIS OF SIMULATED TRANSONIC BOUNDARY LAYERS IN CRYOGENIC-NITROGEN WIND TUNNELS
Jerry B. Adcock and Charles B. Johnson Mar. 1980 40 p refs
(NASA-TP-1631; L-13364) Avail: NTIS HC A03/MF A01 CSCL 14B

A theoretical analysis was made to determine the real gas effects on simulation of transonic boundary layers in wind tunnels with cryogenic nitrogen as the test gas. The analysis included laminar and turbulent flat plate boundary layers and turbulent boundary layers on a two dimensional airfoil. The results indicate that boundary layers in such wind tunnels should not be substantially different from ideal gas boundary layers at standard conditions. At a pressure of 9.0 atm, two separate effects produce deviations of real gas values from ideal gas values which are in the opposite direction from deviations at 1.0 atm and are of the same insignificant order of magnitude. Results also show that nonadiabatic boundary layers should be adequately simulated if the enthalpy ratio is the correlating parameter rather than the temperature ratio. J.M.S.

N80-19132*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
DESIGN CONSIDERATIONS FOR ATTAINING 250-KNOT TEST VELOCITIES AT THE AIRCRAFT LANDING DYNAMICS FACILITY
C. E. Gray, Jr., R. E. Snyder, J. T. Taylor, A. Cires, A. L. Fitzgerald, and M. F. Armistead Feb. 1980 29 p refs
(NASA-TM-80222) Avail: NTIS HC A03/MF A01 CSCL 14B

Preliminary design studies are presented which consider the important parameters in providing 250 knot test velocities at the Aircraft Landing Dynamics Facility. Four major components of this facility are: the hydraulic jet catapult, the test carriage structure, the reaction turning bucket, and the wheels. Using the hydraulic-jet catapult characteristics, a target design point was selected and a carriage structure was sized to meet the required strength requirements. The preliminary design results indicate that to attain 250 knot test velocities for a given hydraulic jet catapult system, a carriage mass of 25,424 kg (56,000 lbm.) cannot be exceeded. R.E.S.

N80-19133*# National Aeronautics and Space Administration, Washington, D. C.
METHODS OF SOUND SIMULATION AND APPLICATIONS IN FLIGHT SIMULATORS
K.-P. Gaertner Jan. 1980 98 p refs Transl. into ENGLISH of "Methoden der Gerawuschsimulation und ihre Anwendung in Flugsimulatoren", Rept-22, Gesellschaft zur Foederund der Astrophysikalischen forschung E. V., Forschungsinstitut fuer Antropotechnik, Meckenheim, West Germany, Apr. 1975 105 p Translation was announced as N77-29179 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75768; Rept-22) Avail: NTIS HC A05/MF A01 CSCL 14B

An overview of methods for electronically synthesizing sounds is presented. A given amount of hardware and computer capacity places an upper limit on the degree and fidelity of realism of sound simulation which is attainable. Good sound realism for aircraft simulators can be especially expensive because of the complexity of flight sounds and their changing patterns through time. Nevertheless, the flight simulator developed at the Research Institute for Human Engineering, West Germany, shows that it is possible to design an inexpensive sound simulator with the required acoustic properties using analog computer elements. The characteristics of the sub-sound elements produced by this sound simulator for take-off, cruise and approach are discussed. Author

N80-19134# ARO, Inc., Arnold Air Force Station, Tenn.
ANALYTIC AND NUMERICAL INVESTIGATION OF THE CONVERGENCE FOR THE ADAPTIVE-WALL CONCEPT Final Report, Oct. 1977 - Mar. 1978
C. F. Lo and W. L. Sickles AEDC Nov. 1979 40 p refs Sponsored by the Air Force
(AD-A078203; AEDC-TR-79-55) Avail: NTIS HC A03/MF A01 CSCL 01/3

Convergence of the iteration for the adaptive wall concept is analytically proved for two-dimensional and axisymmetric subsonic flows. One-step convergence formulae which determine the unconfined boundary conditions directly from two measured flow variables at the measuring surface are presented to accelerate the iterative procedure. The application of the one-step formulae to numerical examples of an NACA 0012 airfoil illustrates the capability of these formulae for subcritical as well as supercritical flows. GRA

N80-19135# ARO, Inc., Arnold Air Force Station, Tenn.
LASER-RAMAN FLOW-FIELD DIAGNOSTICS OF TWO LARGE HYPERSONIC TEST FACILITIES Final Report, 13 Apr. 1977 - 10 Jul. 1978
W. D. Williams, D. A. Wagner, H. M. Powell, and L. L. Price AEDC Dec. 1979 41 p refs
(AD-A078289; AEDC-TR-7988) Avail: NTIS HC A03/MF A01 CSCL 14/2

Laser-Raman scattering has been utilized to discover nonequilibrium N2 vibrational levels in a continuous, resistance-heated wind tunnel (Tunnel C) and in an arc-heated wind tunnel (Tunnel F). Vibrational temperatures of up to two times the bulk reservoir temperature have been measured in the Tunnel F free stream. A double-diaphragm device for delay of the Tunnel F nozzle expansion was found to significantly reduce the vibrational temperature level. In tunnel C, the vibrational temperatures were found to be dependent upon the water vapor concentration in the flow. It is hypothesized that water vapor-induced de-excitation of the vibrationally excited nitrogen molecules results in a

significant rise in local static temperature and corresponding reduction in Mach number. GRA

N80-19136# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
THE HISTORY OF STATIC TEST AND AIR FORCE STRUCTURES TESTING Final Technical Report
Bernard C. Boggs Jun. 1979 299 p refs
(AD-A077029; AFFDL-TR-79-3071) Avail: NTIS HC A13/MF A01 CSCL 14/2

This report traces the history of aircraft static testing from its early beginning and follows the development of structures testing in the United States Air Force from 1917 to 1979. Those technologies that are related to structures testing are included which were important to airplane structures strength. Test technology development which provided test facilities, tests systems and test methods are covered for the static, dynamic, fatigue, and environmental simulation of subsonic, sonic, supersonic, hypersonic and re-entry aircraft missions. GRA

N80-19137# Advisory Group for Aerospace Research and Development, Paris (France).
TOWARD NEW TRANSONIC WINDTUNNELS
J. P. Hartzuiker, ed. (National Aerospace Lab., Amsterdam) Nov. 1979 78 p refs
(AGARD-AG-240; ISBN-92-835-1343-6) Avail: NTIS HC A05/MF A01

Cryogenic concepts for transonic wind tunnels are examined including discussions of tunnel drive and support systems, tunnel performance, and cryogenic aerodynamics. Also presented is an investigation of the flow quality of three transonic tunnels with differing drive mechanisms. Factors effecting a more complete determination of tunnel flow quality are discussed. For individual titles, see N80-19138 through N80-19140.

N80-19138# Royal Aircraft Establishment, Bedford (England).
AN INVESTIGATION OF THE QUALITY OF THE FLOW GENERATED BY THREE TYPES OF WIND TUNNEL (LUDWIEG TUBE, EVANS CLEAN TUNNEL AND INJECTOR DRIVEN TUNNEL)
P. G. Pugh, H. Grauer-Carstensen (DFVLR, Goettingen, West Germany), and C. Quemard (CERT, Toulouse) *In* AGARD Towards New Transonic Windtunnels Nov. 1979 23 p refs (For primary document see N80-19137 10-09)
Avail: NTIS HC A05/MF A01

Flow quality in three wind tunnels with differing drive systems is examined. The investigation included measurements of (1) fluctuating static pressure on the sidewall of the test section; (2) turbulence immediately upstream of the contraction and in the test section; (3) fluctuations of flow angle (both pitch and yaw) in the test section; and (4) fluctuations of both pitot and static pressures in the test section flow. Factors important to the description of wind tunnel flow quality are also discussed. It is shown that the use of fluctuating static pressure as in index of flow quality in invalid when comparing wind tunnels having different forms of drive system or, possibly, even widely different types of test section. Fluctuations in flow angle are of much more direct consequence to the gathering of the usual types of data and can be measured using either appropriately designed yawmeters or with hot-film probes. M.H.

N80-19139*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
DEVELOPMENT OF THE CRYOGENIC TUNNEL CONCEPT AND APPLICATION TO THE US NATIONAL TRANSONIC FACILITY
Robert A. Kilgore *In* AGARD Towards New Transonic Windtunnels Nov. 1979 27 p refs (For primary document see N80-19137 10-09)
Avail: NTIS HC A05/MF A01 CSCL 14B

A fan-driven, high Reynolds number, transonic cryogenic wind tunnel is described. The tunnel has a 2.5- by 2.5 m test section and is capable of operating from ambient to cryogenic temperatures at stagnation pressures up to 8.8 atm. An overview of the cryogenic concept and discussions of drive power requirements, support systems, and operating characteristics and performance of the wind tunnel are included. M.G.

N80-19140# National Aerospace Lab., Amsterdam (Netherlands).
THE CRYOGENIC WIND TUNNEL: ANOTHER OPTION FOR THE EUROPEAN TRANSONIC FACILITY
J. P. Hartzuiker, J. Christophe (ONERA, Paris), W. Lorenz-Meier (DFVLR, Goettingen, West Germany), and P. G. Pugh (RAE, Bedford, England) *In* AGARD Towards New Transonic Wintunnels Nov. 1979 15 p refs (For primary document see N80-19137 10-09)
Avail: NTIS HC A05/MF A01

A cryogenic wind tunnel concept is discussed. The tunnel should have a maximum stagnation pressure of 6 bars, 10 seconds running time, and the Reynolds number (based on mean aerodynamic chord) should be variable between 25 and 40 million, to enable extrapolation of test results to full scale conditions. The advantages and drawbacks of cryogenic testing as well as fundamental aspects of cryogenic aerodynamics are discussed. Comparative estimates for capital and operating costs are finally presented. M.G.

N80-19812# Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (West Germany).
REMARKS ON SIMULATION. OBJECTIVES/AREAS OF USE/POSSIBILITIES/LIMITATIONS: AN OVERVIEW
Hans M. Franke *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 27 p refs (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

N80-19829# Societe Nationale Industrielle Aerospatiale, Marignane (France.) Div. Helicopteres.
DESIGN OF A SIMULATOR FOR STUDYING THE HELICOPTER - SDVEH [CONCEPTION D'UN SIMULATEUR DE VOL D'ETUDE POUR HELICOPTER - SOUEH]
Jl. Mascle, G. Catani, M. Sellier, and Jp. Letouzey *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 13 p In FRENCH (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

N80-19830# Institute for Defense Analyses, Arlington, Va.
COST-EFFECTIVENESS OF FLIGHT SIMULATORS FOR MILITARY TRAINING
Jesse Orlansky and Joseph String *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 13 p refs (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see 91 Lunar and Planetary Exploration.

N80-19141*# KMS Fusion, Inc., Ann Arbor, Mich. Div. of Material Sciences.
GLASS SHELL MANUFACTURING IN SPACE Quarterly Progress Report, 6 Sep. - 6 Dec. 1979
Robert J. Nolen, Mathias A. Ebner, and Raymond L. Downs 18 Jan. 1980 40 p
(Contract NAS8-33103)
(NASA-CR-161408; U976; QPR-4) Avail: NTIS HC A03/MF A01 CSCL 22A

Residual gases always found in glass shells are CO2, O2 and N2. In those cases where high water vapor pressure is maintained in the furnace, water is also found in the shells. Other evidence for the existence of water in shells is the presence of water-induced surface weathering of the interior shell surface. Water and CO2 are the predominant volatiles generated by the pyrolysis of both inorganic and hydrolyzed metal-organic gels. The pyrolysates of unhydrolyzed metal-organic gels also contain, in addition to water and CO2, significant levels of organic volatiles, such as ethanol and some hydrocarbons; on complete oxidation, these produce CO2 and water as well. Water is most likely the initial blowing agent, it is produced copiously during the initial stages of heating. In the later stages, CO2 becomes the dominant gas as H2O is lost at increasing rates. Water in the

shell arises mainly from gel dehydration, CO2 by sodium bicarbonate/carbonate decomposition and carbon oxidation, and O2 and N2 by permeation of the ambient furnace air through the molten shell wall. Author

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N80-19142*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ORBIT DYNAMICS AND GEOGRAPHICAL COVERAGE CAPABILITIES OF SATELLITE-BASED SOLAR OCCULTATION EXPERIMENTS FOR GLOBAL MONITORING OF STRATOSPHERIC CONSTITUENTS
David R. Brooks Mar. 1980 76 p
(NASA-TP-1608; L-12804) Avail: NTIS HC A05/MF A01 CSCL 03B

Orbit dynamics of the solar occultation technique for satellite measurements of the Earth's atmosphere are described. A one-year mission is simulated and the orbit and mission design implications are discussed in detail. Geographical coverage capabilities are examined parametrically for a range of orbit conditions. The hypothetical mission is used to produce a simulated one-year data base of solar occultation measurements; each occultation event is assumed to produce a single number, or 'measurement' and some statistical properties of the data set are examined. A simple model is fitted to the data to demonstrate a procedure for examining global distributions of atmospheric constituents with the solar occultation technique. Author

N80-19143# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
EVOLUTION OF THE ORBITAL IMPROVEMENT PROGRAM
S. C. Dillon Feb. 1979 62 p refs
(Contract N00024-78-C-5384)
(AD-A078842; APL/JHU-TG-1320) Avail: NTIS HC A04/MF A01 CSCL 22/3

The Orbital Improvement Program (OIP) is a massive computer program that determines and predicts orbits for the Navy Navigation Satellite System (Transit system). The system became operational in 1963 and has played a vital part in providing all-weather navigation to worldwide users. The system has been continuously updated and improved. Today, navigation results are regularly under 10 m for operational satellites, providing accuracy far beyond any expectations of the early 1960's. This report describes the evolution of the program, its operational history, and how it has improved naviation accuracy. GRA

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see *also 09 Research Support Facilities (Air)*.

N80-19144*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
DEVELOPMENT OF A COMPOSITE GEODETIC STRUCTURE FOR SPACE CONSTRUCTION, PHASE 1A
31 Jan. 1980 60 p refs
(Contract NAS9-15678)
(NASA-CR-160558; MDC-G8456) Avail: NTIS HC A04/MF A01 CSCL 22B

The development of a geodetic beam and beam builder for on orbit construction of large truss type space structures is discussed. The geodetic beam is a lightweight, open lattice structure composed of an equilateral gridwork of crisscrossing rods. The beam provides a high degree of stiffness and minimizes structural distortion, due to temperature gradients, through the incorporation of a new graphite and glass reinforced thermoplastic composite material with a low coefficient of thermal expansion. A low power consuming, high production rate, beam builder automatically fabricates the geodetic beams in space using rods preprocessed on Earth. Three areas of the development are focused upon; (1) geodetic beam designs for local attachment of equipment or beam to beam joining in a parallel or crossing configurations, (2) evaluation of long life pultruded rods capable of service temperatures higher than possible with the HMS/P1700 rod material, and (3) evalaution of high temperature joint encapsulant materials. A.W.H.

N80-19170*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
FY-79 - DEVELOPMENT OF FIBER OPTICS CONNECTOR TECHNOLOGY FOR LARGE SPACE SYSTEMS
Thomas G. Campbell *In its* Large Space Systems Technol., 1979 Feb. 1980 p 453-466 (For primary document see N80-19145 10-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N80-19145*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
LARGE SPACE SYSTEMS TECHNOLOGY, 1979
James C. Ward, Jr., comp. Feb. 1980 487 p refs Ann. Program Tech. Rev. (1st) held at Hampton, Va., 7-8 Nov. 1979
(NASA-CP-2118; L-13488) Avail: NTIS HC A21/MF A01 CSCL 22B

Items of technology and developmental efforts in support of the large space systems technology programs are described. The major areas of interest are large antennas systems, large space platform systems, and activities that support both antennas and platform systems. For individual titles, see N80-19146 through N80-19172.

N80-19146*# Lockheed Missiles and Space Co., Sunnyvale, Calif. Space Systems Div.
OFFSET WEAP RIB CONCEPT AND DEVELOPMENT
A. A. Woods, Jr. *In* NASA. Langley Res. Center Large Space Systems Technol., 1979 Feb. 1980 p 5-31 (For primary document see N80-19145 10-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

The applicability of the Wrap rib antenna design for offset feed configurations for antennas up to 300 m in diameter was assessed. The antenna design was defined for both symmetric and offset configurations in terms of surface quality, cost, weight, and mechanical complexity. A supporting deployable feed support structure was developed and characterized. K.L.

N80-19147*# TRW, Inc., Redondo Beach, Calif.
ADVANCED SUNFLOWER ANTENNA CONCEPT DEVELOPMENT
J. S. Archer *In* NASA. Langley Res. Center Large Space Systems Technol., 1979 Feb. 1980 p 33-58 Sponsored by JPL (For primary document see N80-19145 10-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

The feasibility of stowing large solid antenna reflectors in the shuttle was demonstrated for applications with 40 foot apertures at frequencies of 100 GHz. Concepts allowing extension of the basic concept to 80-foot apertures operable at 60 GHz were identified. K.L.

N80-19148*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
CONSTRUCTION ALIGNMENT SENSOR FEASIBILITY DEMONSTRATIONS (LASER MEASUREMENT)
R. H. Anderson *In* NASA. Langley Res. Center Large Space Systems Technol., 1979 Feb. 1980 p 59-76 (For primary document see N80-19145 10-15)

(Contract NAS7-100; JPL-955130)
Avail: NTIS HC A21/MF A01 CSCL 22B

The design theory and trade-offs involved in the selection of laser heterodyne sensors for use in active control of spacecraft structures are discussed. These sensors include a HeNe distance measuring system for structures requiring accuracies to .1 mm, a CO2 distance measuring system for measuring unambiguously down to .01 microns, and vibration sensors based on both HeNe and CO2 lasers. K.L.

N80-19149*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
JPL SELF PULSED LASER SURFACE MEASUREMENT SYSTEM DEVELOPMENT
Martin Berdahl *In* NASA. Langley Res. Center Large Space Systems Technol., 1979 Feb. 1980 p 77-94 (For primary document see N80-19145 10-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

The use of a self pulsed laser system for accurately describing the surface shape of large space deployed antenna structures was evaluated. Tests with a breadboard system verified functional operation with short time resolution on the order of .2 mm, nonambiguous ranging, and a maximum range capability on the order of 150 m. The projected capability of the system is resolution of less than .1 mm over a reasonable time period and a range extension to over 300 m. K.L.

N80-19150*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
FY-79 - LSST ANTENNA TECHNOLOGY DEVELOPMENT
Thomas G. Campbell *In its* Large Space Systems Technol., 1979 Feb. 1980 p 95-114 (For primary document see N80-19145 10-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

The development of technology needed to design, fabricate, transport, and deploy large antenna systems is reported. Accomplishments include: (1) development of scenarios for near term missions in communications, microwave radiometry, and radio astronomy; (2) conceptual designs for critical components of a hoop/column reflector; (3) development of a surface accuracy measurement system; and (4) development of electromagnetic analysis methods for large aperture antennas. K.L.

N80-19151*# Harris Corp., Melbourne, Fla.
DEVELOPMENT OF THE MAYPOLE (HOOP/COLUMN) DEPLOYABLE REFLECTOR CONCEPT FOR LARGE SPACE SYSTEMS APPLICATIONS
D. C. Montgomery and L. D. Sikes *In* NASA. Langley Res. Center Large Space Systems Technol., 1979 Feb. 1980 p 115-156 refs (For primary document see N80-19145 10-15)
(Contract NAS1-15763)
Avail: NTIS HC A21/MF A01 CSCL 22B

The conceptual design, performance projections, and materials development for the maypole (hoop/column) reflector concept are summarized. Factors influencing configuration choices are discussed along with quad aperture/feed characteristics and antenna requirements based on missions. K.L.

N80-19152*# TRW, Inc., Redondo Beach, Calif.
SURFACE ACCURACY MEASUREMENT SENSOR FOR DEPLOYABLE REFLECTOR ANTENNAS (SAMS DRA)
Robert S. Neiswander *In* NASA Langley Res. Center Large Space Systems Technol., 1979 Feb. 1980 p 157-171 (For primary document see N80-19145 10-15)
(Contract NAS1-15220)
Avail: NTIS HC A21/MF A01 CSCL 22B

Specifications, system configurations, and concept tests for surface measurement sensors for deployable reflector antennas are presented. Two approaches toward the optical measurement of remote target displacements are discussed: optical ranging, in which the basic measurement is target-to-sensor range; and in particular, optical angular sensing, in which the principle measurements are of target angular displacements lateral to the line of sight. Four representative space antennas are examined. M.G.

N80-19153*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
DEVELOPMENT OF ELECTROMAGNETIC ANALYSIS METHODS FOR LARGE APERTURE ANTENNAS
C. R. Cockrell, L. D. Staton, and P. K. Agrawal *In its* Large Space Systems Technol., 1979 Feb. 1980 p 173-185 refs (For primary document see N80-19145 10-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

Both deterministic and statistical analysis methods for investigating large aperture antenna radiation patterns are examined. The effects of surface errors on radiation patterns are discussed. M.G.

N80-19154*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ELECTROSTATIC FORMING
J. W. Goslee *In its* Large Space Systems Technol., 1979 Feb. 1980 p 187-192 (For primary document see N80-19145 10-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

The electrostatic forming of antenna and reflector surfaces through the controlled deformation of a reflective membrane is described. M.G.

N80-19155*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
SURFACE MEASURING TECHNIQUE
Robert B. Spiers, Jr. *In* NASA. Langley Res. Center Large Space Systems Technol., 1979 Feb. 1980 p 193-198 ref (For primary document see N80-19145 10-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

Measurement of the surface contour of a large electrostatically formed concave reflector using a modified Foucault or knife edge test is described. The curve of the actual electrostatically formed reflector surface is compared to a curve representing a reference sphere. Measurements of surface slope and deviation are calculated every 15 cm along the reflector's horizontal and vertical diameters. Characterization of surface roughness on a small scale compared to the laser spot size at the reflector are obtained from the increased laser spot size at a distant projection screen. M.G.

N80-19156*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
STRUCTURAL CONCEPTS FOR LARGE SPACECRAFT
H. G. Bush, W. L. Heard, Jr., and J. E. Walz *In its* Large Space Systems Technol., 1979 Feb. 1980 p 199-215 refs (For primary document see N80-19145 10-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

Design concepts for deployable spacecraft structures are examined with particular emphasis on mass/area optimization, stowability, and assembly, and the relations of these requirements to functional design parameters. Component and modular concepts for platforms and reflectors, structural configurations for long columns, pretension columns, and joint concepts are discussed. A brief overview of astronaut and automated assembly studies is included. M.G.

N80-19157*# Vought Corp., Dallas, Tex.
ERECTABLE/DEPLOYABLE CONCEPTS FOR LARGE SPACE SYSTEM TECHNOLOGY
W. E. Agan *In* NASA. Langley Res. Center Large Space Systems Technol., 1979 Feb. 1980 p 217-246 (For primary document see N80-19145 10-15)
(Contract NAS8-33431)
Avail: NTIS HC A21/MF A01 CSCL 22B

Erectable/deployable space structure concepts particularly relating to the development of a science and applications space platform are presented. Design and operating features for an automatic coupler clevis joint, a side latching detent joint, and a module-to-module auto lock coupler are given. An analysis of the packaging characteristics of stacked subassembly, single fold, hybrid, and double fold concepts is given for various platform structure configurations. Payload carrier systems and assembly techniques are also discussed. M.G.

N80-19158*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPACE FABRICATION: GRAPHITE COMPOSITE TRUSS WELDING AND CAP FORMING SUBSYSTEMS
L. M. Jenkins and D. L. Browning (General Dynamics/Convair)

In NASA. Langley Res. Center Large Space Systems Technol., 1979 Feb. 1980 p 247-261 ref (For primary document see N80-19145 10-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

An automated beam builder for the fabrication of space structures is described. The beam builder forms a triangular truss 1.3 meters on a side. Flat strips of preconsolidated graphite fiber fabric in a polysulfone matrix are coiled in a storage canister. Heaters raise the material to forming temperature then the structural cap section is formed by a series of rollers. After cooling, cross members and diagonal tension cords are ultrasonically welded in place to complete the truss. The stability of fabricated structures and composite materials is also examined.
M.G.

N80-19159*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
STRUCTURAL ASSEMBLY IN SPACE
Jack W. Stokes and Edwin C. Pruett (Essex Corp.) *In* NASA. Langley Res. Center Large Space Systems Technol., 1979 Feb. 1980 p 263-285 refs (For primary document see N80-19145 10-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

A cost algorithm for predicting assembly costs for large space structures is given. Assembly scenarios are summarized which describe the erection, deployment, and fabrication tasks for five large space structures. The major activities that impact total costs for structure assembly from launch through deployment and assembly to scientific instrument installation and checkout are described. Individual cost elements such as assembly fixtures, handrails, or remote minipulators are also presented.
R.C.T.

N80-19160*# Rockwell International Corp., Canoga Park, Calif. Satellite Systems Div.
SPACE CONSTRUCTION AND UTILITY DISTRIBUTION
K. A. Bloom *In* NASA. Langley Res. Center Large Space Systems Technol., 1979 Feb. 1980 p 287-301 (For primary document see N80-19145 10-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

Technology advancement to effect an orderly development program leading to construction of space platforms was defined, in a program that utilized a viable platform and service module concept with concise OSS/OAST mission and payload models. Consideration was given to concepts for alternate platform servicing of the payloads described in the model. Using the baseline configuration, issues pertinent to platform development as well as orbit emplacement and operation and on orbit construction methodology were analyzed. These analyses provided the following data: (1) payload definitions and installation options; (2) identified structural and subsystems options; (3) developed integrated platform system concepts; and (4) identified technology deficiencies and recommended technology development timelines.
R.C.T.

N80-19161*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A HIGH RESOLUTION SOIL MOISTURE RADIOMETER
L. R. Dod *In* NASA. Langley Res. Center Large Space Systems Technol., 1979 Feb. 1980 p 303-312 ref (For primary document see N80-19145 10-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

The design of an L-band high resolution soil moisture radiometer is described. The selected system is a planar slotted waveguide array at L-band frequencies. The square aperture is 74.75 m by 74.75 m subdivided into 8 tilted subarrays. The system has a 290 km circular orbit and provides a spatial resolution of 1 km. The aperture forms 230 simultaneous beams in a cross-track pattern which covers a swath 420 km wide. A revisit time of 6 days is provided for an orbit inclination of 50 deg. The 1 km resolution cell allows an integration time of 1/7 second and sharing this time period sequentially between two orthogonal polarization modes can provide a temperature resolution of 0.7 K.
R.C.T.

N80-19162*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
LARGE SPACE SYSTEM CONTROL TECHNOLOGY OVERVIEW
Gary L. Parker *In* NASA. Langley Res. Center Large Space Systems Technol., 1979 Feb. 1980 p 313-321 (For primary document see N80-19145 10-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

The nature of the problems which confront large space structure technology controls are discussed. Emphasis is placed on the following: the basic performance requirements; structural modal errors; the effect of certain disturbances (i.e., solar pressure, gravity gradient torques, and aerodynamic drag); and surface or figure control.
R.C.T.

N80-19163*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
LARGE SPACE SYSTEM CONTROL TECHNOLOGY STATUS AND ACCOMPLISHMENTS
G. Rodriguez and Gary L. Parker *In* NASA. Langley Res. Center Large Space Systems Technol., 1979 Feb. 1980 p 323-342 refs (For primary document see N80-19145 10-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

In the area of antenna modeling and control, preliminary structural models were defined for two representative parabolic reflectors. A control system design evolved for attitude control of the reflectors. The controller design was based on a lumped control concept where the control hardware (sensor and actuators) was mounted at the base of the antenna. In the area of distributed control, static shape control techniques were worked out to establish a prescribed vehicle shape. The corresponding estimation process for determination of vehicle shape from selected sensor measurements was also developed. A model order reduction study was conducted to find the best preflight dynamical models for on board controller design. The problems caused by truncation of the vehicle dynamics required to minimize on board computations were investigated. Estimator designs were developed for on board detection of large structure model errors.
R.C.T.

N80-19164*# Purdue Univ., Lafayette, Ind.
LARGE SPACE SYSTEM CONTROL TECHNOLOGY MODEL ORDER REDUCTION STUDY
R. E. Skelton *In* NASA. Langley Res. Center Large Space Systems Technol., 1979 Feb. 1980 p 343-357 Sponsored by JPL (For primary document see N80-19145 10-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

The mission control requirements for large space structures are presented as well as some of the problems associated with the active control of large structures in space. A generic model is introduced that contains most of the desired features in the modeling and control problem for large space structures.
R.C.T.

N80-19165*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
LaRC CONTROLS ACTIVITY FOR LSST
R. C. Montgomery *In its* Large Space Systems Technol., 1979 Feb. 1980 p 359-381 (For primary document see N80-19145 10-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

Math models were developed for various types of large flexible structures. These models were used to study the uncontrolled dynamic characteristics of the structures in orbit and to devise control concepts in order to control their orientation and geometrical shape. Reduced order decoupled control of the 100 meter long free free beam were studied. The inplane orientation and shape of the beam was controlled in a decoupled manner with as few actuators as possible. Using two controllers, near each end of the beam, to produce a 0.01 radian pitch change, perfect decoupled control was achieved for the rigid body pitch theta mode and the first flexible mode A sub 1.
R.C.T.

N80-19166*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTERACTIVE ANALYSIS PROGRAM ACTIVITY
J. P. Young, H. P. Frisch, G. K. Jones (Boeing Aerospace Co.), and W. J. Walker *In* NASA. Langley Res. Center Large Space Systems Technol., 1979 Feb. 1980 p 383-407 (For primary document see N80-19145 10-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

The development of an analysis software system capable of performing interdisciplinary preliminary design analyses of large space structure configurations is discussed. Disciplines such as thermal, structures, and controls are to be integrated into a highly user oriented analysis capability. The key feature of the integrated analysis capability, a rapid and efficient system that will minimize solution turnaround time, is discussed. A.W.H.

N80-19167*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
JPL ANALYTICAL PERFORMANCE PREDICTION CAPABILITY
R. Chen *In* NASA. Langley Res. Center Large Space Systems Technol., 1979 Feb. 1980 p 409-421 (For primary document see N80-19145 10-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

The development of a computer code to simulate and predict the performance of large deployable antenna structures is discussed. The computer code is expected to account for all phases of hardware use, i.e., ground handling, boost, deployment, on orbit station keeping, and transfer from LEO to GEO, if applicable. In addition to accounting for static and dynamic loading of the basic structure, the variation in the precision of the reflector surface and the alignment of the feed support structure as a function orbit are scrutinized in order to accommodate electromagnetic analysis. Specific tasks directed towards the development of the computer code are reported and a number of thermal and structural models are discussed. A.W.H.

N80-19168*# Boeing Aerospace Co., Seattle, Wash.
LARGE SPACE SYSTEMS TECHNOLOGY ELECTRONICS: DATA AND POWER DISTRIBUTION
W. G. Dunbar *In* NASA. Langley Res. Center Large Space Systems Technol., 1979 Feb. 1980 p 423-442 (For primary document see N80-19145 10-15)
(Contract NAS8-33432)
Avail: NTIS HC A21/MF A01 CSCL 22B

The development of hardware technology and manufacturing techniques required to meet space platform and antenna system needs in the 1980s is discussed. Preliminary designs for manned and automatically assembled space power system cables, connectors, and grounding and bonding materials and techniques are reviewed. Connector concepts, grounding design requirements, and bonding requirements are discussed. The problem of particulate debris contamination for large structure spacecraft is addressed. A.W.H.

N80-19169*# Alabama Univ., University.
SOLID-STATE SWITCH MODELING
Wilford D. Raburn *In* NASA. Langley Res. Center Large Space Systems Technol., 1979 Feb. 1980 p 443-452 (For primary document see N80-19145 10-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

A model for predicting voltages and currents of passive loads during turn on and turn off of remote power controllers is presented. The model is concerned with two devices, a five ampere device and a twenty ampere device. The model is presented as a general circuit diagram. The load current is determined by the load parameters and the conditions at switching and the steady state conditions are reached according to time constants determined by the load. The model is used to analyze the turn on and turn off conditions of certain loads including a R-C load and a R-L load. A.W.H.

N80-19170*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
FY-79 - DEVELOPMENT OF FIBER OPTICS CONNECTOR TECHNOLOGY FOR LARGE SPACE SYSTEMS c14
Thomas G. Campbell *In its* Large Space Systems Technol., 1979 Feb. 1980 p 453-466 (For primary document see N80-19145 10-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

The development of physical concepts for integrating fiber optic connectors and cables with structural concepts proposed for the LSST is discussed. Emphasis is placed on remote connections using integrated cables. A.W.H.

N80-19171*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
FLEXIBLE MATERIALS TECHNOLOGY
W. H. Steurer *In* NASA. Langley Res. Center Large Space Systems Technol., 1979 Feb. 1980 p 467-484 (For primary document see N80-19145 10-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

A survey of all presently defined or proposed large space systems indicated an ever increasing demand for flexible components and materials, primarily as a result of the widening disparity between the stowage space of launch vehicles and the size of advanced systems. Typical flexible components and material requirements were identified on the basis of recurrence and/or functional commonality. This was followed by the evaluation of candidate materials and the search for material capabilities which promise to satisfy the postulated requirements. Particular attention was placed on thin films, and on the requirements of deployable antennas. The assessment of the performance of specific materials was based primarily on the failure mode, derived from a detailed failure analysis. In view of extensive on going work on thermal and environmental degradation effects, prime emphasis was placed on the assessment of the performance loss by meteoroid damage. Quantitative data were generated for tension members and antenna reflector materials. A methodology was developed for the representation of the overall materials performance as related to systems service life. A number of promising new concepts for flexible materials were identified.
Author

N80-19172*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ADVANCED MATERIALS FOR SPACE
Darrel R. Tenney, Wayne S. Slemp, Edward R. Long, Jr., and George F. Sykes *In its* Large Space Systems Technol., 1979 Feb. 1980 p 485-504 (For primary document see N80-19145 10-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

The principal thrust of the LSST program is to develop the materials technology required for confident design of large space systems such as antennas and platforms. Areas of research in the FY-79 program include evaluation of polysulfones, measurement of the coefficient of thermal expansion of low expansion composite laminates, thermal cycling effects, and cable technology. The development of new long thermal control coatings and adhesives for use in space is discussed. The determination of radiation damage mechanisms of resin matrix composites and the formulation of new polymer matrices that are inherently more stable in the space environment are examined. Author

N80-19173*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACE PROCESSING APPLICATIONS ROCKET PROJECT SPAR 4, ENGINEERING REPORT Final Report
Fred Reeves, comp. Jan. 1980 194 p
(NASA-TM-78235; M-287) Avail: NTIS HC A09/MF A01 CSCL 22A

The materials processing experiments in space, conducted on the SPAR 4 Black Brant VC rocket, are described and discussed. The SPAR 4 payload configuration, the rocket performance, and the flight sequence are reported. The results, analyses, and anomalies of the four experiments are discussed. The experiments conducted were the uniform dispersions of crystallization processing, the contained polycrstalline solidification in low gravity, the containerless processing of ferromagnetic materials, and the containerless processing technology. The instrumentation operations, payload power relay anomaly, relay postflight operational test, and relay postflight shock test are reported.
A.W.H.

N80-19174# Air Force Geophysics Lab., Hanscom AFB, Mass.
SPACECRAFT CHARGING MODEL: TWO MAXWELLIAN APPROXIMATION Environmental Research Paper
P. Tsipouras and H. B. Garrett 13 Jul. 1979 29 p refs
(AF Proj. 7661)
(AD-A077907; AFGL-TR-79-0153; AFGL-ERP-667) Avail: NTIS HC A03/MF A01 CSCL 04/1

The ambient plasma environment at geosynchronous orbit is assumed to be represented by a two-component Maxwell-

Boltzmann particle distribution. Given this, the equations for ambient electron and ion currents to the spacecraft are easily integrated. Likewise, the secondary and backscattered currents can be expressed as integrals. The potential at which the currents balance gives the potential between the spacecraft and ambient plasma. The model is compared with actual data from ATS-5 and is found to agree within plus or minus 1, 200 V over a range of 0 to minus 10,000 V. The model is readily applicable to the simple environmental model of Garrett and DeForest (1979) and can be calibrated to any given satellite. Simple algorithmic expressions are also developed for the backscattered and secondary currents as a function of temperature and potential which promise a significant decrease in computer time without a significant loss in accuracy. GRA

N80-19175# Systems Consultants, Inc., Ridgecrest, Calif.
HARPOON PYROTECHNIC SHOCK STUDY Final Report, Jul. 1973 - Jul. 1979
Dan Powers (McDonnell Douglas Astronautics Co.), Charles E. Wright, and William N. Jones Sep. 1979 39 p refs
(Contract N00123-76-C-0340)
(AD-A078727; NWC-TP-6133) Avail: NTIS HC A03/MF A01 CSCL 16/4

A study was conducted to compare predicted Harpoon missile pyrotechnic shock response with Harpoon missile design criteria. This report discusses the pyrotechnic shock environment and component failures encountered in this type of environment. Correct shock test simulation techniques and 'state-of-the-art' limitations are delineated. Actual testing techniques and test apparatus that can be used to achieve the proper test environment are discussed. Both actual test data and predicted shock levels are presented. Shock spectra environment predictions are made for several types of explosive activated devices. Test data were measured during Harpoon ejection tests and are presented as shock spectra. GRA

N80-19176# Lincoln Lab., Mass. Inst. of Tech., Lexington.
PHOTOMETRY OF ARTIFICIAL SATELLITES APPLICATION TO THE GROUND ELECTRO-OPTICAL DEEP SPACE SURVEILLANCE (GEODSS) PROGRAM
John M. Souvani Oct. 1979 50 p refs
(Contract F19628-80-C-0002; AF Proj. 2128)
(AD-A078675; TN-1979-61; ESD-TR-79-261) Avail: NTIS HC A03/MF A01 CSCL 17/8

This note defines the basic concept of an astronomical photometric system and examines it in the context of the GEODSS program. Several different systems are developed. Each to fit a particular part of the overall mission for photometry in the GEODSS program. The different kinds of errors arising in each system are examined and their impact upon the goals of GEODSS photometry is assessed. Of particular note is the role of aliasing in the photometry of artificial satellites. It is concluded that if care is taken, photometry can be a useful part of the GEODSS program. GRA

N80-19177# Lincoln Lab., Mass. Inst. of Tech., Lexington.
GEOMETRY, ARTIFICIAL SATELLITES, AND ORBIT DETERMINATION
Laurence G. Taff 4 Sep. 1979 20 p refs
(Contract F19628-78-C-0002; AF Proj. 2128)
(AD-A077049; TN-1979-55; ESD-TR-79-215) Avail: NTIS HC A02/MF A01 CSCL 22/3

The large proper motions and diurnal parallaxes of earth-bound artificial satellites coupled with the use of devices more sophisticated than the photographic plate to record their motion force one to consider methods of analysis beyond the traditional ones. In particular, it is theoretically possible to deduce from the streak made by the passage of a celestial object a complete specification of its location and velocity. Thus, for artificial satellites, one has the possibility of orbital element set construction from a complete set of initial conditions without recourse to any approximations. In this report, I show how and why this is possible. The practical situation is less hopeful however, in that the distance and radial velocity can be determined only if the streak has measurable curvature. Extremely accurate plus or minus 0.05 sec/sec angular velocities should be obtainable. The positional accuracy is a function of the driving of the telescope. GRA

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N80-19178*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ORBIT ATTITUDE PROCESSOR. STS-1 BENCH PROGRAM VERIFICATION TEST PLAN
C. R. McClain (McDonnel Douglas Technical Services Co.) Jan. 1980 41 p ref
(JSC-16386; Rept-80-FM-7) Avail: NTIS HC A03/MF A01 CSCL 09B

A plan for the static verification of the STS-1 ATT PROC ORBIT software requirements is presented. The orbit version of the SAPIENS bench program is used to generate the verification data. A brief discussion of the simulation software and flight software modules is presented along with a description of the test cases. R.C.T.

N80-19179*# Aerojet Liquid Rocket Co., Sacramento, Calif.
ORBITAL TRANSFER VEHICLE (OTV) ADVANCED EXPANDER CYCLE ENGINE POINT DESIGN STUDY Bimonthly Status Report, 1 Dec. 1979 - 31 Jan. 1980
J. A. Mellish 15 Feb. 1980 23 p
(Contract NAS8-33574)
(NASA-CR-161389; Rept-33574-M2; BMR-2) Avail: NTIS HC A02/MF A01 CSCL 22B

Progress in the development of a performance optimized engine system design for an advanced LOX/hydrogen expander cycle engine is reported. Analysis of the components and engine and the resulting drawings is discussed. The status of the orbit transfer vehicle liquid engine transient simulation computer model is given. J.M.S.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

N80-19180# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
CRYSTAL-CONTROLLED PROJECTILE TELEMETRY TRANSMITTER Final Report
Robert E. Hicks, William D. Lipps, William C. Trimble, and Daniel D. Zimmerman Adelphi, Md. US Army Material Development and Readiness Command Jul. 1979 73 p
(AFOSR MIPR R-76-29)
(AD-A078214; HDL-CR-79-029-1) Avail: NTIS HC A04/MF A01 CSCL 09/6

This final report describes the task of redesigning a crystal-controlled projectile telemetering transmitter operating at L-band frequencies. The purpose of the transmitter is for deployment in artillery projectiles to telemeter various performance attributes. Prior efforts on this task included (1) a basic circuit design development by Harry Diamond Laboratories to demonstration electrical circuit feasibility, excluding packaging ruggedization considerations, and (2) a production engineering program by Motorola's Government Electronics Division. The approach taken in this effort was based upon the previous work and development of solutions to the complex problems encountered before. These included the combined performance of the oscillator stability, frequency multiplication, microwave stripline filtering, and rf power amplification in a small volume. In addition, the design was to be inexpensive and easily reproducible. A design was developed that proved to be adequate in satisfying the stability requirements and surviving the high acceleration forces

of the artillery environment. The electrical performance problem of the microwave stripline filter was not completely solved, and the proximity effects and resonant cavity responses at the transmitter frequency were determined to be the technical limitations to this design approach. Alternate design approaches have been proposed for solving this serious producibility problem. GRA

N80-19181# National Technical Information Service, Springfield, Va.
BIOTELEMETRY, VOLUME 2. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, Jan. 1978 - Dec. 1979
Elizabeth A. Harrison Dec. 1979 64 p Supersedes NTIS/PS-78/1271; NTIS/PS-77/1121; NTIS/PS-76/1021
(PB80-802101; NTIS/PS-78/1271; NTIS/PS-77/1121; NTIS/PS-76/1021) Avail: NTIS HC $30.00/MF $30.00 CSCL 06B

The use of biotelemetry in biomedical information systems, biometeorology, animal and bird migrations, bioinstrumentation, electrocardiography, ecology, and electroencephalography are topics addressed. This updated bibliography contains 59 abstracts, 24 or which are new entries to the previous edition. GRA

N80-19182# National Technical Information Service, Springfield, Va.
BIOTELEMETRY. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1970 - Dec. 1979
Elizabeth A. Harrison Dec. 1979 256 p Supersedes NTIS/PS-78/1269; NTIS/PS-77/1120; NTIS/PS-76/1020; NTIS/PS-75/855; NTIS/PS-75/094
(PB80-802093; NTIS/PS-78/1269; NTIS/PS-77/1120; NTIS/PS-76/1020; NTIS/PS-75/855; NTIS/PS-75/094) Avail: NTIS HC $30.00/MF $30.00 CSCL 06B

Biomedical information systems and the use of biotelemetry are reported. Biometerology, animal and bird migrations, bioinstrumentation, electrocardiography, ecology, and electroencephalography as related to biotelemetry are included. This updated bibliography contains 314 abstracts, 80 of which are new entries to the previous edition. GRA

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

N80-19183*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ATTITUDE CONTROL STUDY FOR A LARGE FLEXIBLE SPACECRAFT USING A SOLAR ELECTRIC PROPULSION SYSTEM (SEPS)
A. F. Tolivar and R. W. Key 1 Mar. 1980 314 p
(Contract NAS7-100)
(NASA-CR-162878; JPL-Pub-80-14) Avail: NTIS HC A14/MF A01 CSCL 22B

The attitude control performance of the solar electric propulsion system (SEPS) was evaluated. A thrust vector control system for powered flight control was examined along with a gas jet reaction control system, and a reaction wheel system, both of which have been proposed for nonpowered flight control. Comprehensive computer simulations of each control system were made and evaluated using a 30 mode spacecraft model. Results obtained indicate that thrust vector control and reaction wheel systems offer acceptable smooth proportional control. The gas jet control system is shown to be risky for a flexible structure such as SEPS, and is therefore, not recommended as a primary control method. J.M.S.

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N80-19184*# National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Tex.
FIELD RESONANCE PROPULSION CONCEPT
Alan C. Holt Aug. 1979 13 p refs
(NASA-TM-80961; JSC-16073) Avail: NTIS HC A02/MF A01 CSCL 21C

A propulsion concept was developed based on a proposed resonance between coherent, pulsed electromagnetic wave forms, and gravitational wave forms (or space-time metrics). Using this concept a spacecraft propulsion system potentially capable of galactic and intergalactic travel without prohibitive travel times was designed. The propulsion system utilizes recent research associated with magnetic field line merging, hydromagnetic wave effects, free-electron lasers, laser generation of megagauss fields, and special structural and containment metals. The research required to determine potential, field resonance characteristics and to evaluate various aspects of the spacecraft propulsion design is described. R.C.T.

N80-19185*# General Dynamics/Convair, San Diego, Calif.
CAPILLARY ACQUISITION DEVICES FOR HIGH-PERFORMANCE VEHICLES: EXECUTIVE SUMMARY
M. H. Blatt, R. D. Bradshaw, and J. A. Risberg Feb. 1980 103 p refs
(Contract NAS3-20092)
(NASA-CR-159658; GDC-CRAD-80-003) Avail: NTIS HC A06/MF A01 CSCL 21H

Technology areas critical to the development of cryogenic capillary devices were studied. Passive cooling of capillary devices was investigated with an analytical and experimental study of wicking flow. Capillary device refilling with settled fluid was studied using an analytical and experimental program that resulted in successful correlation of a versatile computer program with test data. The program was used to predict Centaur D-1S LO2 and LH2 start basket refilling. Comparisons were made between the baseline Centaur D-1S propellant feed system and feed system alternatives including systems using capillary devices. The preferred concepts from the Centaur D-1S study were examined for APOTV and POTV vehicles for delivery and round trip transfer of payloads between LEO and GEO. Mission profiles were determined to provide propellant usage timelines and the payload partials were defined. A.W.H.

N80-19186*# Aerojet Liquid Rocket Co., Sacramento, Calif.
ADVANCED OXYGEN-HYDROCARBON ROCKET ENGINE STUDY Bimonthly Progress Report
C. J. OBrien 11 Feb. 1980 22 p
(Contract NAS8-33452)
(NASA-CR-161390; Rept-33452-M2) Avail: NTIS HC A02/MF A01 CSCL 21H

Preliminary identification and evaluation of promising liquid oxygen/ hydrocarbon (LO2/HC) rocket engine cycles is reported. A consistent and reliable data base for vehicle optimization and design studies, to demonstrate the significance of propulsion

system improvements, and to select the critical technology areas necessary to realize such advances is presented. J.M.S.

N80-19187# ARO, Inc., Arnold Air Force Station, Tenn.
BIPROPELLANT ENGINE PLUME CONTAMINATION PROGRAM. VOLUME 2: CHAMBER MEASUREMENTS, PHASE 2 Final Report
H. M. Powell, L. L. Price, and R. E. Alt AEDC Nov. 1979 113 p refs
(AD-A077435; AEDC-TR-79-28-Vol-2) Avail: NTIS HC A06/MF A01 CSCL 21/8

A bipropellant rocket engine plume contamination test program was conducted in the AEDC Aerospace Chamber (10V). A 5-lbf-thrust rocket engine, burning MMH as the fuel and N2O4 as the oxidizer, was operated over a range of engine operating parameters in a cryogenically pumped vacuum chamber where the background pressure was maintained below 0.00001 torr. Using the electron beam fluorescence technique, species number densities and rotational temperture were measured in both the forward- and back-flow region of the plume exhaust. Additionally, Mie scattering measurements were performed for the forward-flow regions of the plume exhaust. GRA

N80-19188# ARO, Inc., Arnold Air Force Station, Tenn.
BIOPROPELLANT ENGINE PLUME CONTAMINATION PROGRAM. VOLUME 1: CHAMBER MEASUREMENTS, PHASE 1 Final Report, 5 Sep. - 12 Dec. 1977
R. E. Alt, J. A. Roux, R. E. Wood, and D. F. Franzine AEDC Dec. 1979 103 p refs
(AD-A078412; AEDC-TR-79-28-Vol-1) Avail: NTIS HC A06/MF A01 CSCL 21/8

An experimental program to measure the mass flux in the backflow region of a 5-lbf bipropellant thruster at angles up to 147 deg with respect to the plume centerline using temperature-controlled and temperature-compensated quartz crystal microbalances (QCM'S) is presented. The measurements were conducted in a high vacuum cryogenic chamber (Aerospace Chamber 10V) at AEDC. Gaseous helium and liquid helium cryopanels provided a blank-off pressure in the ten to the minus 6th power torr range and maintained the background pressure in the ten to the minus 5th power torr range while pulse firing the motor (25 to 100 msec pulse width, 1- to 10 percent duty cycle). Chamber recovery time was a few tenths of a second. Several motor configurations and operating conditions were compared for potential contamination effects. GRA

N80-19189# Aerospace Corp., El Segundo, Calif. Materials Sciences Lab.
FAILURE ANALYSIS AND RESIN EVALUATION OF IUS SRM-1 92 INCH PROTOTYPE MOTOR CASE Interim Report
R. W. Fillers, J. F. Ward, and P. K. Grant 28 Sep. 1979 34 p refs
(Contract F04701-78-C-0079)
(AD-A077407; TR-0079(4451-61)-1; SAMSO-TR-79-74) Avail: NTIS HC A03/MF A01 CSCL 21/8

The IUS SRM-1 92-in. diameter prototype Kevlar/epoxy motor case failed catastrophically at approximately 50 percent design load during hydrostatic burst testing on 18 October 1978. The Aerospace Materials Sciences Laboratory has carried out a failure analysis of the SRM-1 prototype motor case, briefly looked at two 18-in. subscale development vessels corresponding to SRM-1 and SRM-2, and carried out a preliminary evaluation of the epoxy resin system used for winding the motor case. Examination of the three motor cases and preliminary examination of the resin system suggest that poor adhesion is obtained between the Kevlar fiber and this epoxy resin and further that this resin system gels in three to four days at room temperature. The result of poor adhesion is not known but is expected to be detrimental to case performance in the dome regions. However, excessively long winding times (on the order of six days), coupled with the short gel times of an extremely brittle resin system plus a lack of temperature control during winding, result in an extremely nonuniform Kevlar/epoxy composite. Since the local strains incurred through both premature gellation and thermal excursions during manufacturing cannot be relieved in a brittle matrix, premature failure can occur in a stepwise fashion at loadings well below design expectations, especially if the composite layers are not uniformly loaded. GRA

N80-19190# Naval Surface Weapons Center, Dahlgren, Va.
ROCKET MOTOR BLAST EFFECTS AND PROPOSED ABLATIVE PROTECTION FOR RAM LAUNCHING SYSTEM EX 43 Final Report
Earl E. Biermann and Allen B. Coates Oct. 1979 92 p
(AD-A077037; NSWC/TR-79-376) Avail: NTIS HC A05/MF A01 CSCL 21/2

The test program described in this report was designed to: (1) investigate the severity of EX 43 launcher and ship damage caused by exhaust blast during flyaway and inadvertent restrained RIM 116A missile firings; and (2) investigate and recommend the type and amount of suitable protective materials required to prevent degradation in the impingement area. The four materials tested in the last phase of this program have been recommended for further qualification testing for survivability in a simulated shipboard environment. GRA

N80-19191# ARO, Inc., Arnold Air Force Station, Tenn.
EXPERIMENTAL STUDIES OF MULTIPLE-SCATTERED LIGHT FROM LATEX SPHERES Final Report, Oct. 1978 - Nov. 1978
D. P. Weaver, B. P. Curry, and J. W. L. Lewis AEDC Oct. 1979 30 p refs
(AD-A076322; AEDC-TR-79-60) Avail: NTIS HC A03/MF A01 CSCL 21/8

This report presents the results of a series of light-scattering measurements on small, spherical particles of a known size distribution and index of refraction. The purpose of the study is to provide additional data for the evaluation of the multiple-scattering model used in a plume visibility code currently being developed for the Air Force. Measurements of both singly and multiple scattered laser radiation from aqueous suspensions of spherical latex particles were performed at several optical depths. Included are descriptions of the light-scattering apparatus and sample preparation techniques used in the study. Also, sample results of the experiments are presented in graphical form with normalized scattering intensity as a function of scattering angle. GRA

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N80-19192# Pennsylvania State Univ., University Park. Dept. of Chemistry.
SMALL-MOLECULE CYCLIC MODELS FOR THE SYNTHESIS OF NEW POLYPHOSPHAZENES SIDE GROUP CONSTRUCTION VIA LITHIOPHENOXY DERIVATIVES Interim Report
H. R. Allcock, T. L. Evans, and T. J. Fuller 29 Nov. 1979 29 p refs
(Contract N00014-75-C-0685)
(AD-A078183; TR-13) Avail: NTIS HC A03/MF A01 CSCL 07/3

Hexa(p-lithiophenoxycyclotriphosphazene) has been synthesized as an intermediate for the covalent attachment of metallo-, phosphino, carboxylato, alkyl, or tertiary alcohol units to the side group structure. These reactions are models for the preparation of the corresponding phosphazene high polymers. GRA

24 COMPOSITE MATERIALS

Includes laminates.

N80-19193*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ASSESSMENT OF CARBON FIBER ELECTRICAL EFFECTS
Washington Mar. 1980 278 p refs Conf. held in Hampton, Va., 4-5 Dec. 1979
(NASA-CP-2119; L-13503) Avail: NTIS HC A13/MF A01 CSCL 11D

The risks associated with the use of carbon fiber composites in civil aircraft are discussed along with the need for protection of civil aircraft equipment from fire-released carbon fibers. The size and number of carbon fibers released in civil aircraft crash fires, the downwind dissemination of the fibers, their penetration into buildings and equipment, and the vulnerability of electrical/electronic equipment to damage by the fibers are assessed. For individual titles, see N80-19194 through N80-19205.

N80-19194*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
APPROACH TO THE ASSESSMENT OF THE HAZARD
Robert J. Huston *In its* Assessment of Carbon Fiber Elec. Effects Mar. 1980 p 11-27 refs (For primary document see N80-19193 10-24)
Avail: NTIS HC A13/MF A01 CSCL 11D

An overview of the carbon fiber hazard assessment is presented. The potential risk to the civil sector associated with the accidental release of carbon fibers from aircraft having composite structures was assessed along with the need for protection of civil aircraft from carbon fibers. K.L.

N80-19195*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
RELEASE OF CARBON FIBERS FROM BURNING COMPOSITES
Vernon L. Bell *In its* Assessment of Carbon Fiber Elec. Effects Mar. 1980 p 29-57 (For primary document see N80-19193 10-24)
Avail: NTIS HC A13/MF A01 CSCL 11D

The results of a burn/explosion test program are presented. The amount of fiber released and the physical characteristics of the fibers are among the data reported. K.L.

N80-19196*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
DISSEMINATION, RESUSPENSION, AND FILTRATION OF CARBON FIBERS
Wolf Elber *In its* Assessment of Carbon Fiber Elec. Effects Mar. 1980 p 59-71 (For primary document see N80-19193 10-24)
Avail: NTIS HC A13/MF A01 CSCL 11D

Carbon fiber transport was studied using mathematical models established for other pollution problems. It was demonstrated that resuspension is not a major factor contributing to the risk. Filtration and fragmentation tests revealed that fiber fragmentation shifts the fiber spectrum to shorter mean lengths in high velocity air handling systems. K.L.

N80-19197*# Bionetics Corp., Hampton, Va.
EVALUATION OF EQUIPMENT VULNERABILITY AND POTENTIAL SHOCK HAZARDS
Israel Taback *In* NASA. Langley Res. Center Assessment of Carbon Fiber Elec. Effects Mar. 1980 p 73-99 (For primary document see N80-19193 10-24)
Avail: NTIS HC A13/MF A01 CSCL 11D

The vulnerability of electric equipment to carbon fibers released from aircraft accidents is investigated and the parameters affecting vulnerability are discussed. The shock hazard for a hypothetical set of accidents is computed. K.L.

N80-19198*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
LARGE-SCALE FIBER RELEASE AND EQUIPMENT EXPOSURE EXPERIMENTS
R. A. Pride *In its* Assessment of Carbon Fiber Elec. Effects Mar. 1980 p 101-136 refs (For primary document see N80-19193 10-24)
Avail: NTIS HC A13/MF A01 CSCL 11D

Outdoor tests were conducted to determine the amount of fiber released in a full scale fire and trace its dissemination away from the fire. Equipment vulnerability to fire released fibers was assessed through shock tests. The greatest fiber release was observed in the shock tube where the composite was burned with a continuous agitation to total consumption. The largest average fiber length obtained outdoors was 5 mm. K.L.

N80-19199*# Bionetics Corp., Hampton, Va.
SURVEYS OF FACILITIES FOR THE POTENTIAL EFFECTS FROM THE FALLOUT OF AIRBORNE GRAPHITE FIBERS
Ansel J. Butterfield *In* NASA. Langley Res. Center Assessment of Carbon Fiber Elec. Effects Mar. 1980 p 137-149 (For primary document see N80-19193 10-24)
Avail: NTIS HC A13/MF A01 CSCL 11D

The impact of the entry of graphite fibers into workplaces in the United States is discussed. Areas where an electrical failure could cause major problems include process and production systems, hospitals, and police/fire emergency communication systems. K.L.

N80-19200*# Operations Research, Inc., Silver Spring, Md.
ASSESSMENT OF THE RISK DUE TO RELEASE OF CARBON FIBER IN CIVIL AIRCRAFT ACCIDENTS, PHASE 2
Leon S. Pocinki, Merrill E. Cornell, and Lawrence Kaplan *In* NASA. Langley Res. Center Assessment of Carbon Fiber Elec. Effects Mar. 1980 p 157-182 refs (For primary document see N80-19193 10-24)
(Contract NAS1-15379)
Avail: NTIS HC A13/MF A01 CSCL 11D

The risk associated with the potential use of carbon fiber composite material in commercial jet aircraft is investigated. A simulation model developed to generate risk profiles for several airports is described. The risk profiles show the probability that the cost due to accidents in any year exceeds a given amount. The computer model simulates aircraft accidents with fire, release of fibers, their downwind transport and infiltration of buildings, equipment failures, and resulting economic impact. The individual airport results were combined to yield the national risk profile. A.W.H.

N80-19201*# Little (Arthur D.), Inc., Boston, Mass.
ASSESSMENT OF RISK DUE TO THE USE OF CARBON FIBER COMPOSITES IN COMMERCIAL AND GENERAL AVIATION
J. Fiksel, Donald Rosenfield, and A. Kalelkar *In* NASA. Langley Res. Center Assessment of Carbon Fiber Elec. Effects Mar. 1980 p 183-211 refs (For primary document see N80-19193 10-24)
Avail: NTIS HC A13/MF A01 CSCL 11D

The development of a national risk profile for the total annual aircraft losses due to carbon fiber composite (CFC) usage through 1993 is discussed. The profile was developed using separate simulation methods for commercial and general aviation aircraft. A Monte Carlo method which was used to assess the risk in commercial aircraft is described. The method projects the potential usage of CFC through 1993, investigates the incidence of commercial aircraft fires, models the potential release and dispersion of carbon fibers from a fire, and estimates potential economic losses due to CFC damaging electronic equipment. The simulation model for the general aviation aircraft is described. The model emphasizes variations in facility locations and release conditions, estimates distribution of CFC released in general aviation aircraft accidents, and tabulates the failure probabilities and aggregate economic losses in the accidents. A.W.H.

N80-19202*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
PERSPECTIVE ON THE RESULTS
Robert J. Huston *In its* Assessment of Carbon Fiber Elec. Effects Mar. 1980 p 213-223 refs (For primary document see N80-19193 10-24)
Avail: NTIS HC A13/MF A01 CSCL 11D

The results of studies on the risk due to the use of carbon fibers in aircraft are assessed. Assumptions such as additional fire protection in the aircraft, new structural concepts, and the development of unique carbon composites are evaluated. Some findings from the national risk profile including equipment vulnerability and economic impact are discussed. A.W.H.

N80-19203*# Westinghouse Electric Corp., Pittsburgh, Pa.
EFFECTS OF CARBON/GRAPHITE FIBER CONTAMINATION ON HIGH VOLTAGE ELECTRICAL INSULATION
Thomas Garrity (DOE) and Charles Eichler *In* NASA. Langley Res. Center Assessment of Carbon Fiber Elec. Effects Mar. 1980 p 235-263 (For primary document see N80-19193 10-24)

Avail: NTIS HC A13/MF A01 CSCL 11D

The contamination mechanics and resulting failure modes of high voltage electrical insulation due to carbon/graphite fibers were examined. The high voltage insulation vulnerability to carbon /graphite fiber induced failure was evaluated using a contamination system which consisted of a fiber chopper, dispersal chamber, a contamination chamber, and air ducts and suction blower. Tests were conducted to evaluate the effects of fiber length, weathering, and wetness on the insulator's resistance to carbon/graphite fibers. The ability of nuclear, fossil, and hydro power generating stations to maintain normal power generation when the surrounding environment is contaminated by an accidental carbon fiber release was investigated. The vulnerability assessment included only the power plant generating equipment and its associated controls, instrumentation, and auxiliary and support systems. A.W.H.

N80-19204*# National Bureau of Standards, Washington, D.C.
EFFECTS OF CARBON FIBERS ON CONSUMER PRODUCTS
Robert A. Wise and C. Denver Lovett *In* NASA. Langley Res. Center Assessment of Carbon Fiber Elec. Effects Mar. 1980 p 265-274 refs (For primary document see N80-19193 10-24)
(NASA Order L-81246-A)
Avail: NTIS HC A13/MF A01 CSCL 11D

The potential effects of carbon fibers on consumer products such as dishwashers, microwave ovens, and smoke detectors were investigated. The investigation was divided into two categories to determine the potential faults and hazards that could occur if fibers should enter the electrical circuits of the selected appliances. The categories were a fault analysis and a hazard analysis. Hazards considered were fire, flood, physical harm, explosion, and electrical shock. Electrical shock was found to be a possible occurrence related to carbon fibers. Faults were considered to be any effect on the performance of an appliance which would result in complaint or require service action.A.W.H.

N80-19205*# Transportation Systems Center, Cambridge, Mass.
RISK ASSESSMENT OF CARBON FIBER COMPOSITE IN SURFACE TRANSPORTATION
W. T. Hathaway and K. M. Hergenrother *In* NASA. Langley Res. Center Assessment of Carbon Fiber Elec. Effects Mar. 1980 p 276-282 refs (For primary document see N80-19193 10-24)
Avail: NTIS HC A13/MF A01 CSCL 11D

The vulnerability of surface transportation to airborne carbon fibers and the national risk associated with the potential use of carbon fibers in the surface transportation system were evaluated. Results show airborne carbon fibers may cause failure rates in surface transportation of less than one per year by 1995. The national risk resulting from the use of carbon fibers in the surface transportation system is discussed. A.W.H.

N80-19206*# Boeing Aerospace Co., Seattle, Wash.
QUALITY CONTROL DEVELOPMENTS FOR GRAPHITE/PMR15 POLYIMIDE COMPOSITES MATERIALS
C. H. Sheppard and J. T. Hoggatt Sep. 1979 187 p
(Contract NAS1-15009)
(NASA-CR-159182; D180-20545-2A) Avail: NTIS HC A09/MF A01 CSCL 11D

The problem of lot-to-lot and within-lot variability of graphite/PMR-15 prepreg was investigated. The PMR-15 chemical characterization data were evaluated along with the processing conditions controlling the manufacture of PMR-15 resin and monomers. Manufacturing procedures were selected to yield a consistently reproducible graphite prepreg that could be processed into acceptable structural elements. K.L.

N80-19207*# National Aeronautics and Space Administration, Washington, D. C.
DETERMINATION OF THE TECHNICAL CONSTANTS OF LAMINATES IN OBLIQUE DIRECTIONS
F. Vidouse Oct. 1979 43 p refs Transl. into ENGLISH of "Determination des Constantes Techniques des Stratifies dans les Directions Obliques - Theorie et Resultats Experimentaux", Rept. CRIF-PL-4 Centre de Recherches Scientifiques et Techniques de l'Industrie des Fabrications Metalliques, Brussels, Nov. 1973 p 1-42 Translation was announced as N74-21166 Transl. by Kanner (Lec) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75719; CRIF-PL-4) Avail: NTIS HC A03/MF A01 CSCL 11D

An off-axis tensile test theory based on Hooke's Law is applied to glass fiber reinforced laminates. A corrective parameter dependent on the characteristics of the strain gauge used is introduced by testing machines set up for isotropic materials. Theoretical results for a variety of strain gauges are compared with those obtained by a finite element method and with experimental results obtained on laminates reinforced with glass. K.L.

N80-19208# Air Force Materials Lab., Wright-Patterson AFB, Ohio. Nonmetallic Materials Div.
TI-59 MAGNETIC CARD CALCULATOR SOLUTIONS TO COMPOSITE MATERIALS FORMULAS Final Technical Report, Oct. 1977 - Oct. 1978
Stephen W. Tsai and H. Thomas Hahn Apr. 1979 55 p ref (AF Proj. 2419)
(AD-A078043; AFML-TR-79-4040) Avail: NTIS HC A04/MF A01 CSCL 11/4

This volume contains the description and instructions of magnetic cards for TI-59 programmable calculators. These tapes contain the key calculations of the stiffness and strength of unidirectional and symmetrically laminated composites. Both in-plane and flexural loadings can be applied. The initial stress and strain due to curing and moisture adsorption are also included in the strength calculation. With the aid of the magnetic cards, instant calculations can be made for practical use. The use of cards is also an effective teaching tool. The formulas used in the cards have been derived in another AFML report, entitled, "Introduction to Composite Materials', AFML-TR-78-201. GRA

N80-19209# Michigan Univ., Ann Arbor. Dept. of Materials and Metallurgical Engineering.
SINTERING OF BETA SILICON NITRIDE SOLID SOLUTIONS CONTAINING METAL OXIDE Final Report, 1 Jul. 1978 - 30 Jun. 1979
T. Y. Tien 1979 43 p refs
(Grant AF-AFOSR-3078-76; AF Proj. 9761)
(AD-A077415; TR-014536-78-1) Avail: NTIS HC A03/MF A01 CSCL 11/2

Reaction sintering of Beta-Si3N4 solid solutions was studied, using powder mixtures of SiO2 and AlN; Si3N4, AlN and Al2O3; and Si3N4, SiO2 and AlN. Although the different starting mixtures resulted in the same final composition, substantial differences in sintering kinetics take place depending on the influence of chemical reactions, vaporization, and densification by transient liquid phase sintering. This behavior can be explained qualitatively on the basis of the solid-liquid equilibria in the Si, Al/N,O system. Reaction sintered Beta-Si3N4 solid solutions with the highest densities were prepared from mixtures of Si3N4, AlN and Al2O3 powders without application of external pressure or additional densification aids. In contrast, mixtures containing SiO2, showed less densification even with liquid present because of vaporization during sintering. GRA

N80-19210# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Materials Engineering.
THE OXIDATION OF GRAPHITIC MONOLAYERS ON Ni(110)
Radhesyam Sau and John B. Hudson 1 Dec. 1979 21 p refs
(Contract N00014-75-C-0730)
(AD-A078512; TR-7) Avail: NTIS HC A02/MF A01 CSCL 11/8

The reaction between oxygen gas and a graphitic carbon monolayer formed on an initially clean Ni(110) surface has been studied by a combination of Auger electron spectrometric and molecular beam relaxation spectrometric techniques. The only gaseous reaction product observed is CO. The kinetics of the reaction at 873K are well described by a model involving oxygen adsorption at defects in the graphitic monolayer followed by reaction to produce CO at these points and the subsequent growth of holes in the carbon layer as reaction proceeds. GRA

N80-19211# Dyna East Corp., Wynnewood, Pa.
EFFECTS OF PROOF-TEST ON THE STRENGTH AND FATIGUE LIFE OF A UNIDIRECTIONAL COMPOSITE Interim Technical Report, 1 Apr. 1978 - 31 Mar. 1979
A. S. D. Wang, Pei Chi Chou, and James Alper Wright-Patterson AFB, Ohio AFML May 1979 32 p refs
(Contract F33615-77-C-5039; AF Proj. 2419)
(AD-A076334; AFML-TR-79-4089) Avail: NTIS HC A03/MF A01 CSCL 11/4

The effects of a static proof-load on the statistical distribution of the static strength and fatigue life of a unidirectional graphite-epoxy laminate (As-3501-05) are investigated experimentally. Loading mode for both the static and fatigue tests is restricted to uniaxial tension in the fiber direction. 6 ply tension coupons with dimensions of 22.9 cm x 1.9 cm are used; and all tests are conducted using a closed-loop Instron tester, under room temperature (21 C) and ambient humidity (60% R.H.) conditions. The data are analyzed using a two-parameter Weibull distribution in conjunction with the max. likelihood method for parameter estimation. Results show that proof-load can guarantee a min. static strength, and to less degree can assure a min. fatigue life. GRA

N80-19212# California Univ., Berkeley. Lawrence Berkeley Lab. Chemical Biodynamics Div.
X-RAY ABSORPTION STUDIES OF GRAPHITE INTERCALATES AND METAL AMMONIA SOLUTIONS Ph.D. Thesis
A. S. Robertson Sep. 1979 248 p refs
(LBL-9840) Avail: NTIS HC A11/MF A01

X-ray absorption spectroscopy (XAS) was used to study the arsenic fluorocomplexes, including the AsF5 and AsF6(-) intercalates of graphite, and rubidium metal-ammonia solutions. The As-F distances obtained for AsF3 and AsF5 gas are both in excellent agreement with electron diffraction data. A superior measurement which is significantly shorter than the accepted value of the bond distance in an undistorted AsF6(-) octahedra is reported. The data presented support the hypothesis that the AsF5 oxidizes graphite upon intercalation to produce AsF6(-). In the X-ray region, intensity and position changes of absorption transitions are explained. In the extended X-ray absorption fire structure region, the Rb-N bond distance and the relative number of nitrogen atoms in the first shell are measured. Information is provided about the nature of the metal-ammonia phase separation, phase transition, and density fluctuations. DOE

N80-19213# General Electric Co., Schenectady, N. Y. Metallurgy Lab.
DEVELOPMENT OF A LOW LOSS MAGNETIC COMPOSITE UTILIZING AMORPHOUS METAL FLAKES Progress Report, 19 Mar. - 18 Sep. 1979
Oct. 1979 60 p
(Contract ET-78-C-01-3205)
(CONS-3205-T2; SAPR-2) Avail: NTIS HC A04/MF A01

Composite specimens of amorphous metal flakes were made using several different binders and several different compaction parameters. The binders have included epoxies, anaerobic adhesives, polyimides, polyamidemides, polyehermides, and polyesterimides. Compaction variables included the time, temperature, and pressure of compaction flake size, and flake alignment. The best results were achieved using a polyetherimide and aligned flake. Packing factors of 87% were achieved in specimens which also exhibited high mechanical integrity and the ability to withstand a high temperature anneal. DOE

N80-19214# California Univ., Berkeley. Lawrence Berkeley Lab.
THE CORROSION OF SILICATE MATERIALS BY HYDROGEN GAS AND HYDROFLUORIC ACID SOLUTION
Stephen T. Tso Oct. 1979 115 p refs
(Contract W-7405-eng-48)
(LBL-9887) Avail: NTIS HC A06/MF A01

The reactions of silicate materials with hydrogen gas were studied. The mechanism for the reaction of pure silica glass with hydrogen gas investigated. Alumino-silicate glasses and calcium alumino silicate glasses were used to reveal the compositional effect on corrosion resistance. Different methods were employed to increase the corrosion resistance. Mullite was found to have potential as a material for coal gasification applications. The reactions between silicate glasses and hydrofluoric acid solution were also investigated. The difference in reaction rates for different glasses were explained on the basis of phase separation and crystallization. These two reactions (with hydrogen gas and hydrofluoric acid solution) are in strong contrast in several aspects. The latter is diffusion controlled while the former is kinetically controlled. Therefore, no empirical relative corrosion resistance between them was found. DOE

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics*.

N80-19215 Baylor Univ., Waco, Tex.
AN IMPROVED DISPERSION SYSTEM FOR SIMULTANEOUS MULTIELEMENT ANALYSIS BY FLAME SPECTROSCOPY Ph.D. Thesis
Betsy Ellen Malloy 1979 142 p
Avail: Univ. Microfilms Order No. 8003328

A wavelength dispersion system for use with a multichannel detector was developed for simultaneous multielement analysis. The system employs a monochromator with grating position fixed and incident angle varied by horizontal displacement of entrance slits. In additional, slits may be displaced vertically to create a two-dimensional system. Various aspects of instrumental performace were evaluated. The system was applied to the analysis of blood serum for sodium, potassium, and calcium, and to the analysis of clays for the exchangeable cations calcium, sodium, potassium, and lithium. The system has many of the advantages of a direct reading spectrometer, with the additional advantages of background correction and individual observation height optimization for each element. Dissert. Abstr.

N80-19218 British Library Lending Div., Boston Spa (England).
PROSPECTS FOR BROADENING THE RANGE OF INORGANIC BINDING AGENTS
M. M. Sychev and N. V. Arkincheeva Sep. 1979 9 p refs Transl. into ENGLISH from Neorganicheskie i organosilikatye pokrytiya 6th Union Conf. (USSR), 1973 20-23 Mar. 1973 p 350-355
(RTS-11804; BLL-RTS-11804) Avail: British Library Lending Div., Boston Spa, Engl.

In binding agents, the following transmutations occur: acid salt yields neutral salt yields basic salt yields hydroxy salt yields hydroxide. Of the acid binders, the salts of heteropoly acids and possibly a few sulfates show promise. Apart from these, the range of acid binders can be broadened by means of the oxynitrates and oxychlorides Zn, Cr, Ce, and Ti. In terms of obtaining alkaline binders, the hydroxy salts look promising. For some elements, the results of the analysis were corroborated by experiments. Acid binders were achieved by a synthesis of the basic salts of zironium as well as on the basis of acid soldium salts of phosphomolybdic and phosphotungstic heteroacids. Aluminate solutions are also proposed as binding agents. A.R.H.

N80-19217*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ISOELECTRIC FOCUSING OF RED BLOOD CELLS IN A DENSITY GRADIENT STABILIZED COLUMN
Adam J. K. Smolka and Teresa Y. Miller Feb. 1980 27 p refs Sponsored in part by the Universities Space Res. Assoc.
(NASA-TM-78268) Avail: NTIS HC A03/MF A01 CSCL 07D

The effects of Ficoll and cell application pH on red blood cell electrophoretic mobility and focusing pH were investigated by focusing cells in a density gradient stabilized column. Sample loading, cell dispersion, column conductivity, resolution of separation, and the effect of Ampholines were examined. K.L.

N80-19218# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Chemistry.

PHOTOCHEMICAL TRANSIENTS OF ELECTRODE BOUND METHYLENE BLUE Progress Report, 15 Jun. 1978 - 1 Oct. 1979

Charles E. Baumgartner, Gary T. Marks, Herbert H. Richtol, and David A. Aikens Dec. 1979 14 p refs

(Contract N00014-78-C-0494)

(AD-A078908; TR-2) Avail: NTIS HC A02/MF A01 CSCL 07/4

A 520 nm transient was observed as the result of the interaction of methylene blue triplet with methylene blue bound to an electrode surface. The transient was observed by laser flash photolysis in an outgassed thin layer transparent electrochemical cell filled with a solution of .001 M methylene blue and 0.1M KCl in 50% aqueous methanol or 50% aqueous acetonitrile. The 520 nm transient is observed after application of an anodic potential of 0.1V to 0.7V vs Ag/AgCl for a few seconds on a Pt, Au or SnO2 electrode. The results indicate that methylene blue triplet is the precursor of the species associated with the 520 nm transient and this transient involves interaction of the triplet with electrodeposited dye. GRA

N80-19218# Columbia Univ., New York.

PICOSECOND LASER STUDIES OF AROMATIC RADICAL IONS Final Report, 1 Aug. 1976 - 31 Jul. 1979

K. B. Eisenthal Nov. 1979 8 p refs

(Grant DAAG29-76-G-0310)

(AD-A078721; ARO-14086.4-C) Avail: NTIS HC A02/MF A01 CSCL 07/4

A sophisticated picosecond laser and detection system has been constructed and used to obtain new information on key energy relaxing phenomena in molecular systems. GRA

N80-19220# California Univ., Irvine. Combustion Lab.

EXPERIMENTAL ASSESSMENT OF NITROGEN OXIDES TRANSFORMATIONS WHILE SAMPLING COMBUSTION PRODUCTS Interim Report

Ronald Clinton Benson Jan. 1978 75 p refs

(Grant AF-AFOSR-2710-74; AF Proj. 2308)

(AD-A078090; UCI-ARTR-78-1; AFOSR-79-1232TR) Avail: NTIS HC A04/MF A01 CSCL 07/2

Analysis of combustion products is performed by conveying the exhaust effluents to instrumentation by means of a sample probe and sampling line. Frequently, the selection of sampling materials does not consider potential chemical transformations that can occur in the sample line and probe. Nitrogen oxides are combustion products that are especially vulnerable to transformations. Nitric oxide (NO) and nitrogen dioxide (NO2) are the primary components of NOx. The ratio of NO/NO2 emissions from combustion sources is not well established (due to the potential reduction of NO2 to NO in sample probes and sample lines) and the total emission of NOx is subject to uncertainty in some cases (due to potential removal of NOx in sample probes and sample lines). The objective of the present study is to investigate the extent of transformations of NOx in the presence of oxidizing and reducing species. Stainless steel and silica were the two sampling tube materials used in this investigation. Simulated combustion products of 500 ppm NO, 75 ppm NO2, 12% CO2 bal N2 at 25 C were common to all tests. The oxidizing species and concentrations considered included 1 and 5% O2. Various concentrations of carbon monoxide, hydrogen, and hydrocarbons were used for the reducing species. Temperature and pressure effects were evaluated in this particular study. The results indicated that transformation was more pronounced in stainless steel than silica. GRA

N80-19221# George Washington Univ., Washington, D. C. Dept. of Chemistry.

FINAL STATE CORRELATION EFFECTS IN AUGER LINESHAPES: APPLICATION TO SILICON DIOXIDE

David E. Ramaker Nov. 1979 63 p refs Submitted for publication

(Contract N00014-78-C-0496; RR0130801; NR Proj. 056-681)

(AD-A078037; TR-1) Avail: NTIS HC A04/MF A01 CSCL 07/2

Final state correlation effects in Auger lineshapes are considered within the cluster LCAO-MO-CI theory with a parameterized Hamiltonian. A model problem is solved analytically to elucidate the role of final state hole-hole correlation and to understand the localization of the holes on rather small subclusters of the system. The relationship of the correlation effects to the relative magnitudes of the one-center hole-hole repulsion u and the bandwidth gamma has been previously reported; however, this previous work has been limited to metallic single element conductors. This work extends the theory to covalently bonded insulators (and possibly semiconductors) consisting of more than one element. GRA

N80-19222# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.

SUBMILLIMETER WAVE SPECTROSCOPY AND TECHNOLOGY Final Report, 1 Jan. - 30 Jun. 1979

J. J. Gallagher 8 Oct. 1979 75 p refs

(Grant DAAG29-76-G-0280)

(AD-A078003; ARO-14104.5-PX) Avail: NTIS HC A04/MF A01 CSCL 07/4

The investigations performed during the final 6 months of the program are described. These included optically-pumped laser spectroscopy of liquid water and water vapor and submillimeter receiver investigations. Papers on work performed during this period are attached. GRA

N80-19223# Colorado State Univ., Fort Collins. Dept. of Chemistry.

ELECTROCHEMISTRY OF SOLUTES IN CHLOROALUMINATE MELTS AND THE DEVELOPMENT OF RELATED ELECTROCHEMICAL METHODOLOGY Final Report, 1 Apr. 1978 - 30 Jun. 1979

Robert A. Osteryoung and Janet G. Osteryoung 1979 23 p refs

(Grant AF-AFOSR-2978-76)

(AD-A078242; AFOSR-79-1242TR) Avail: NTIS HC A02/MF A01 CSCL 07/4

Molten haloaluminates were investigated as solvent systems for the study of electrochemical reactions. The particular interest has been in the fact that systems, such as the molten terachloroaluminates, show significant acid-base dependent behavior which is reflected in solute electrochemistry. In the NaCl:AlCl3 system (sodium tetrachloraluminate), the acid-base chemistry of oxides and chalcogenides was investigated. The electrochemistry of Mo, Se and Te was investigated; Mo was studies in the basic melt (excess NaCl) while Se and Te were investigated as a function of melt acidity and a variety of acidity dependent electrochemical reactions were uncovered. The electrochemistry of Ni(II) was also investigated, and it was found that NiCl2 was insoluble in the neutral and basic melt. At 175 C the melt becomes saturated with NaCl at about 1% excess. Although not subject to detailed investigation, it was found that oxygen reduction in this melt could be catalyzed by the presence of metal cations, such as Cu(I) and Mo(V). The electrochemistry of a number of aromatic polynuclear hydrocarbons was studied across the acidity range. All were shown to undergo a one-electron oxidation to the radical cation that was independent of melt acidity and, compared to ferrocene, oxidized at the same relative potential as in acetonitrile. The electrochemistry of a number of metal carbonyls was investigated in another room temperature melt, a 2:1 mixture of aluminum chloride and ethypyridinium bromide. GRA

N80-19224# SRI International Corp., Menlo Park, Calif.

PHOTODISSOCIATION AND PHOTODETACHMENT OF ATMOSPHERIC NEGATIVE IONS Final Report, 15 Aug. 1978 - 14 Aug. 1979

J. T. Moseley, L. C. Lee, R. V. Hodges, and G. P. Smith Aug. 1979 113 p refs

(Contracts F49620-78-C-0119; DAAG29-76-C-0023; DAHC04-73-C-0016; DAEA18-71-A-0204)

(AD-A078091; SRI-MP-79-66; AFOSR-79-1262TR) Avail: NTIS HC A06/MF A01 CSCL 07/4

Photodetachment and photodissociation cross section measurements have been made for a wide variety of negative ions considered to be of atmospheric importance at wavelengths of 2484, 3500, (3507 and 3569 combined) 4067, and 4131 angstroms. The ions for which cross sections were measured included O-, OH-, O2-, O3-, O4-, CO3-, CO4-, NO2-, NO3-, Cl2-, ClO2-, Cl3-, and BrCl2-, as well as hydrates of many of these ions. The photodissociation of CO3- in the region of the

threshold near 6550 angstroms was reinvestigated in detail, because of the present controversy concerning the bond energy of this ion. These measurements more strongly confirmed our previous conclusion that the bond energy of this ion is less than 1.9 eV. All measurements were made using a drift tube mass spectrometer photodestruction apparatus and with a krypton ion laser or a rare gas halogen laser. GRA

N80-19225# Indiana Univ. at Bloomington. Dept. of Chemistry.
EVALUATION OF CLASSICAL VAPORIZATION AND IONIZATION INTERFERENCES IN A MINITIATURE ICP
R. N. Savage and G. M. Hieftje Nov. 1979 42 p refs
(Contract N00014-76-C-0838)
(AD-A077886; TR-23) Avail: NTIS HC A03/MF A01 CSCL 07/4

The magnitude of several classical interelement interferences in a miniature ICP is found to be small but dependent on experimental conditions. The origin and manifestation of these interference (matrix effects are shown to be complex and influenced most strongly by: (1) observation window in the plasma's tail flame, (2) rf power, and (3) nebulizer gas flow rate. In particular, vaporization interference matrices (al and PO4) caused a depression in the intensities of both the neutral atom and ion lines of Ca with the Ca II line experiencing a larger effect than that of Ca I. Conversely, easily ionized elements (such as Na and Cs) enhanced both Ca and Mg neutral atom and ion line intensities, with the atom lines exhibiting a larger increase than those of the ions. Because both the neutral atom and ion lines of Ca and Mg are enhanced by Na and Cs, and to identical degrees, a simple shift in ionization equilibria seems not to produce the observed interference. Clearly, more fundamental knowledge concerning the formation and excitation of atoms in ICP sources is needed before interference mechanisms can be elucidated. GRA

N80-19226# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.
DESIGN OF A PROGRAM FOR EXPERT DIAGNOSIS OF ACID BASE AND ELECTROLYTE DISTURBANCES
Ramesh S. Patil May 1979 42 p refs
(Contract N00014-75-C-0661)
(AD-A078413; MIT/LCS/TM-132) Avail: NTIS HC A03/MF A01 CSCL 06/5

This research develops the diagnostic component of an interactive system for providing expert advice for the diagnosis, therapy and ongoing management of patients with acid-base and electrolyte disturbances. We have developed a hierarchic representation of a patient's illness which unifies the known facts about the patients, their suspected interrelationships, the hypotheses and how hypotheses account for various known and hypothesized facts. An expectation driven problem solver based on the hypothesized and reformulated paradigm performs the diagnosis. GRA

N80-19227# Thiokol Corp., Huntsville, Ala.
FOURIER TRANSFORM INFRARED SPECTROSCOPY (FTIS). VOLUME 1: TECHNICAL REPORT Final Report, Apr. 1978 - Dec. 1979
W. W. Schwarz Dec. 1979 279 p refs 2 Vol.
(Contract F04611-78-C-0027; AF Proj. 5730)
(AD-A079996; U-79-18-Vol-1; AFRPL-TR-79-91-Vol-1) Avail: NTIS HC A13/MF A01 CSCL 07/4

This is the final report of a contract to establish the relationship between infrared spectra and propellant aging and to determine the applicability of this relationship to the prediction of service life of propellants. Equipment for measurement of infrared spectra by both attenuated total reflectance and through transmission was identified, and procedures for sample preparation and testing were developed and demonstrated. Computer programs for reducing the infrared spectra data and statistically analyzing them were developed and made operational on the CDC 6600 computer at the Air Force Rocket Propulsion Laboratory. Aging programs were conducted for two composite solid propellants, and the correlations between their infrared spectra and tensile properties as aging progressed were determined. Equations were established for the prediction of future tensile properties from spectral properties acquired during aging. The major accomplishments of this project are the establishment of methods for predicting propellant tensile properties from infrared spectral data during storage and the development of procedures and computer programs for rapidly and economically processing large amounts of infrared data. The results of this project are a major step toward predicting the remaining shelf life of solid propellant rocket motors from infrared measurements using small amounts of propellant associated with them. Recommendations for application of these results and for improving and extending the developed methods are included in the report. GRA

N80-19228# Thiokol Corp., Huntsville, Ala.
FOURIER TRANSFORM INFRARED SPECTROSCOPY (FTIS). VOLUME 2: USER'S MANUAL Final Report, Apr. 1978 - Dec. 1979
W. W. Schwarz and O. C. Smith Dec. 1979 219 p refs 2 Vol.
(Contract F04611-78-C-0027; AF Proj. 5730)
(AD-A079997; U-79-18-Vol-2) Avail: NTIS HC A10/MF A01 CSCL 07/4

This is the final report to establish the relationship between infrared spectra and propellant aging and to determine the applicability of this relationship to the prediction of service life of propellants. This document (Volume 2 - User's Manual) describes the two computer programs E410 and E490 that were developed in order to reduce and statistically analyze the infrared spectral data. The version of these two codes decribed herein was made operational on the CDC 6600 computer at the Air Force Rocket Propulsion Laboratory. With minor modifications to these two FORTRAN codes themselves, along with the appropriate job control language, both E410 and E490 can also be made operational on an IBM 360/370 computer system. GRA

N80-19229# Pennsylvania State Univ., University Park.
PHOTOCHEMISTRY AND RADIATION CHEMISTRY OF VOLATILE SILANES AND GERMANES Progress Report, 1 Sep. 1978 - 31 Aug. 1979
F. W. Lampe 1979 34 p refs
(Contract EY-76-S-02-3416)
(COO-3416-13) Avail: NTIS HC A03/MF A01

The following are reported reactions of methyl cations with ethylsilanes; reactions of ethyl, propyl, and butyl cations with methyl and ethylsilanes; the 14 nanometer photolysis of disilane; lifetimes and collisional stabilization of chemically activated ethylsilyl cations; formation of GeH(+) and the proton affinity of GeH4; and multiphoton infrared decomposition of silanes. DOE

N80-19230# California Univ., Berkeley. Lawrence Berkeley Lab.
CAMAC SYSTEM FOR COMPUTER CONTROL OF MICROWAVE SPECTROMETERS
G. Zizka, B. Turko, and B. Kolbe 1 Jun. 1979 20 p refs
(Contract W-7405-eng-48)
(LBL-9276) Avail: NTIS HC A02/MF A01

An interface between a microwave spectrometer and a computer is described. It consists of three CAMAC modules and uses a standard CAMAC crate and controller. The hardware, in conjunction with appropriate software routines, was designed to synchronize measurements, to collect data, and to control the microwave frequency and other experimental parameters. DOE

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N80-19231 Illinois Univ. at Urbana-Champaign.
IN VIVO AND IN VITRO AGING OF PLASMA-SPRAYED ALUMINA ON 316L STAINLESS STEEL AND Ti6Al-4V ELI SUBSTRATES Ph.D. Thesis
James Lawrence Drummond 1979 156 p
Avail: Univ. Microfilms Order No. 8004160

Plasma spraying of alumina on metal substrates was

investigated as a fabrication method for prosthetic appliances. The response of this metal-alumina bond to aging in deionized, distilled water, Ringer's solution, Medium-199, and Sprague-Dawley rats was a significant decrease in adherence. Statistical analyses suggested the existence of at least two different modes of fracture occurring in the tensile pull-off tests. Analysis of the deionized, distilled water by flame emission spectroscopy revealed disproportionate removal of calcium and sodium when compared to the amount of aluminum removed. The analysis of Sprague-Dawley rats after implantation of these plasma-sprayed alumina metal composites indicated increased cellular activity of the thyroid and parathyroid glands, beginning degradation of the kidneys, and deposition of aluminum in rat tissues. A hypothesis of the role of aluminum in this process is presented. Dissert. Abstr.

N80-19232 Wisconsin Univ. - Madison.
THE EFFECT OF NICKEL AND NITROGEN ON VOID FORMATION IN VANADIUM Ph.D. Thesis
Randy George Lott 1979 197 p
Avail: Univ. Microfilms Order No. 8001158

The effects of 1 atomic percent nickel and 1 atomic percent nitrogen additions on void and precipitate formation in copper ion irradiated vanadium were determined. Results are compared to current theories of void nucleation and void growth. Voids were observed in all of the irradiated pure vanadium specimens. A decrease in void swelling and density was observed in specimens irradiated at 450 C and 550 C to doses in excess of 2 dpa. Vanadium-1% nitrogen specimens exhibited only sparse void populations when irradiated under conditions identical to the pure vanadium irradiations. When void nucleation was assisted by hydrogen doping, voids grew rapidly in the V-1% N alloy. Evidence of an incubation dose required for void nucleation was observed in the vanadium-1% nickel alloy. No voids were observed in the V-1% Ni specimens irradiated at 650 C to 1 dpa and 5 dpa and at 550 C to 1 dpa. Dissert. Abstr.

N80-19233 British Library Lending Div., Boston Spa (England).
PRACTICAL ELECTROPLATING PROPERTIES OF ELECTROCHEMICALLY DEPOSITED METAL AND ALLOY COATINGS. PART 1: GOLD AND GOLD ALLOYS
H. Benninghoff Oct. 1979 26 p refs Transl. into ENGLISH from Metalloberflaeche (West Germany) v. 33, no. 2, 1979 p 60-67
(BLL-TRS-11923) Avail: British Library Lending Div., Boston Spa, Engl.

The mechanical and electrical properties of gold and gold alloy electrochemically deposited coatings are discussed. R.E.S.

N80-19234 British Library Lending Div., Boston Spa (England).
STABILITY TO HEAT TREATMENT OF NICKEL-MANGANESE DEPOSITS CONTAINING SULPHUR
W. R. Wearmouth Nov. 1979 14 p refs Transl. into ENGLISH from Metalloberflaeche (West Germany), v. 32, no. 8, 1978 p 338-343
(BLL-RTS-11591) Avail: British Library Lending Div., Boston Spa, Engl.

The effect of manganese sulphamate on internal stresses and hardness in nickel deposits from the Ni-Speed electrolyte was investigated. It is shown that sulfur-containing additives can be used under certain conditions for hardening such deposits without entailing sulfur embrittlement at higher temperatures. The structure of nickel-manganese deposits and the effect of heat treatment are described with the aid of optical-metallographic and electron-micrographic studies. The fracture characteristics were obtained from fractographic photography for selected samples. A.R.H.

N80-19235 British Library Lending Div., Boston Spa (England).
THE LIQUIDUS SURFACE OF THE ALUMINUM-TITANIUM-BORON PHASE DIAGRAM AT THE ALUMINUM CORNER
Fumio Morimune, Hideo Shingu, Kojiro Kobayashi, and Ryohei Ozaki Aug. 1979 21 p refs Transl. into ENGLISH from Nippon Kinzoku Gakkaishi (Sendai City), v. 41, 1977 p 444-450
(BLL-RTS-11695) Avail: British Library Lending Div., Boston Spa, Engl.

Experiments based chiefly on solid-liquid separation by gravity segregation were conducted in order to establish whether the solid-liquid reactions at the boundaries between the TiB2 liquidus and TiAl3 liquidus surfaces, and between the TiB2 liquidus and Al liquidus surfaces, are eutectic or peritectic reactions. Present results for the phase diagram suggest that cast grains of aluminum are nucleated on TiB2 particles when the titanium and boron concentrations of the alloy lie in the range defined by the following inequality: 0 < total Ti - 2.07 X total B < 0.15. A.R.H.

N80-19236*# Nebraska Univ. - Lincoln.
GAS PHASE HYDROGEN PERMEATION IN ALPHA TITANIUM AND CARBON STEELS Progress Report, 1973 - 1978
Donald L. Johnson, Kiritkumar K. Shalk Bruce H. Reeves, and Vijay L. Gadgeel Washington NASA Apr. 1980 58 p refs (Grant NGR-28-004-025)
(NASA-CR-3190) Avail: NTIS HC A04/MF A01 CSCL 11P

Commercially pure titanium and heats of Armco ingot iron and steels containing from 0.008-1.23 w/oC were annealed or normalized and machined into hollow cylinders. Coefficients of diffusion for alpha-Ti and alpha-Fe were determined by the lag-time technique. Steady state permeation experiments yield first power pressure dependence for alpha-Ti and Sievert's law square root dependence for Armco iron and carbon steels. As in the case of diffusion, permeation data confirm that alpha-titanium is subject to at least partial phase boundary reaction control while the steels are purely diffusion controlled. The permeation rate in steels also decreases as the carbon content increases. As a consequence of Sievert's law, the computed hydrogen solubility decreases as the carbon content increases. This decreases in explained in terms of hydrogen trapping at carbide interfaces. Oxidizing and nitriding the surfaces of alpha-titanium membranes result in a decrease in the permeation rate for such treatment on the gas inlet surfaces but resulted in a slight increase in the rate for such treatment on the gas outlet surfaces. This is explained in terms of a discontinuous TiH2 layer. A.R.H.

N80-19237*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
METHOD OF FORMING DYNAMIC MEMBRANE ON STAINLESS STEEL SUPPORT Patent Application
J. L. Gaddis (Clemson Univ., S.C.) and Craig A. Brandon, inventors (to NASA) (Clemson Univ., S.C.) Filed 7 Feb. 1980 10 p Sponsored by NASA
(NASA-Case-MSC-18172-1; US-Patent-Appl-SN-119334) Avail: NTIS HC A02/MF A01 CSCL 11F

A method for forming a membrane on a porous stainless steel substrate is disclosed. The stainless steel substrate is prepared from sintered, powdered stainless steel and contacted with an aqueous nitrate solution of a suitable polyvalent metal such as iron, zirconium, tin, or thorium. Contact between the substrate and the aqueous nitrate solution is maintained until the flow rate diminishes indicating that the hydrous metal oxide membrane has formed. Variables affecting the process include the applied pressure, the pore size, and the concentration of the aqueous nitrate solution. The advantage of the method is that membranes are formed on stainless steel substrates without corroding the stainless steel. Membranes deposited on the surface of porous substrates are used in hyperfiltration to remove contaminating chemicals from aqueous solutions by reverse osmosis. Such reverse osmosis membranes are used in desalination and other water purification equipment, and may have application in textile industries for separating dyes from aqueous solvents. J.M.S.

N80-19238*# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
ISS-SIMS SURFACE CHARACTERIZATION OF SMUT ON STAINLESS STEEL Final Report, Jul. 1978 - Jul. 1979
William L. Baun Oct. 1979 23 p refs
(AD-A078122; AFML-TR-79-4138) Avail: NTIS HC A02/MF A01 CSCL 11/6

Chemical treatments such as acid pickling on stainless steels frequently leave behind more contamination than was originally present. This contamination can be deleterious to further processing or the use of stainless steels in such applications as adhesive bonding. This chemical residue that is left behind following treatments such as acid pickling is usually called smut. Smut is formed in this work on 304 stainless steel by treatment

in sulfuric acid. The smut formed on the stainless steel is characterized by ion scattering spectrometry (ISS) and secondary ion mass spectrometry (SIMS). It was found that the majority of the smut formed on 304 stainless steel was not carbon or graphite but rather silicon in an oxidized form. This silicon rich smut was effectively removed by a further chemical treatment with sulfuric acid and chromic acid, a similar mixture to that often used for cleaning glass. This cleaning procedure is shown by the surface chemical analysis methods to produce a clean surface comparable to that obtained by abrasion. GRA

N80-19239# Colt Industries, Inc., Pittsburgh, Pa. Crucible Materials Research Center.
CONSOLIDATION OF TITANIUM POWDER TO NEAR NET SHAPES Final Report, 1 Feb. 1974 - 1 Mar. 1978
J. H. Schwertz, V. K. Chandhok, V. C. Peterson, and V. R. Thompson May 1978 333 p refs
(Contract F33615-74-C-5114)
(AD-A078039; AFML-TR-78-41) Avail: NTIS HC A15/MF A01 CSCL 11/6

This program was conducted to develop the technology necessary to establish a cost effective approach to the production of titanium alloy parts for both aircraft engine and airframe applications. This approach was based on a PM near-net shape process utilizing ceramic mold techniques in conjunction with HIP (Hot Isostatic Pressing) to a minimum machining envelope. Program objectives included: (1) the optimization of an existing PM process for the HIP of near-net shapes of titanium using low-cost tooling; (2) the reduction of the process to an efficient, cost effective, manufacturing procedure; and (3) thorough characterization of the end product. In cooperation with General Electric (GE) and McDonnell-Douglas (MCAIR) as sub-contractors, representative components and alloys were selected for this program. These were a Ti-17 compressor stub shaft and a Ti-6-4 keel splice former. Hot Isostatic Pressing parameters were optimized for both the Ti-17 and Ti-6-4 alloy using the ceramic mold process. SiO2 was chosen as the most promising mold material. The ability to produce near-net shapes of both engine and airframe components was successfully demonstrated. Both parts exhibited comparable properties to cast and wrought material with the exception of low cycle fatigue requirements on the engine stub shaft. The results indicate that a potential exists for the HIP process to reduce both input material and machining costs compared to current cast and wrought product. GRA

N80-19240# Air Force Materials Lab., Wright-Patterson AFB, Ohio. Nonmetallic Materials Div.
CONTAMINATION OF THE ANODE AND CATHODE IN PHOSPHORIC ACID ANODIZING ELECTROLYTES Interim Report, Jul. 1978 - Jul. 1979
William L. Baun Sep. 1979 31 p refs
(AF Proj. 2419)
(AD-A077885; AFML-TR-79-4132) Avail: NTIS HC A03/MF A01 CSCL 13/8

The surface analysis of anodes and cathodes from phosphoric acid electrolytes by ion scattering spectrometry (ISS) and secondary ion spectrometry (SIMS) shows that contamination can occur under a variety of conditions. Contamination can occur both during and after anodization and either with or without the electrodes connected. These results point up the dynamic and ever changing character of the anodization process and suggests reasons for poor reproducibility of oxide chemistry and morphology. GRA

N80-19241# SRI International Corp., Menlo Park, Calif.
IMPROVED IMPACT FRACTURE RESISTANCE IN OXIDATION-TOUGHENED Si3n4-20 VOL% ZrO2 Technical Report, 2 Feb. 1979 - 1 Feb. 1980
D. A. Shockey and K. C. Dao Dec. 1979 19 p refs
(Contract N00014-76-C-0657)
(AD-A078833) Avail: NTIS HC A02/MF A01 CSCL 14/2

Dr. F. F. Lange is using an oxidation technique to induce compressive stresses in the near-surface regions of Si3N4-ZrO2 specimens. Silicon nitride powder is first thoroughly mixed with about 20 vol % zirconium oxide and 4 vol % Al2O3 powders, then hot pressed to achieve a fully dense plate. The plate is then given a subsequent anneal at 700 C for 5 hr in air. The zirconium oxynitride within several grain diameters of the surfaces is oxidized to the monoclinic form with an accompanying increase in molar volume of about 4-5%. The expansion of the lattice in the surface regions gives rise to substantial compressive stresses on the surface (and significant tensile stresses in the interior). GRA

N80-19242# Dayton Univ. Research Inst., Ohio.
DETERMINATION OF TEST TECHNIQUE INFLUENCE ON K SUB ISCC VALUES FOR ALUMINUM 7075-T651 Interim Report, Jan. 1978 - Apr. 1979
John J. Ruschau Aug. 1979 24 p refs
(Contract F33615-78-C-5002; AF Proj. 2421)
(AD-A077453; UDR-TR-79-32; AFML-TR-79-4117) Avail: NTIS HC A02/MF A01 CSCL 14/2

Threshold stress intensity values for stress corrosion cracking K sub ISCC were determined for aluminum alloy 7075-T651 using two different testing techniques: a constant displacement, decreasing stress intensity technique achieved via a bolt-loaded specimen, and a constant load, increasing stress intensity technique. The test specimen geometry was an ASTM standard 3/4-inch (19 mm) compact type specimen. A constant immersion, 3.5 percent by weight sodium chloride environment was used for evaluating both techniques. Test times were limited to 2000 hours. For the test period examined, the constant displacement technique yields an approximately 50 percent higher threshold for corrosion cracking than does the constant load technique. The bolt-loaded technique offers simplicity, is inexpensive, and is a useful technique when used to rank materials as to their relative susceptibility to corrosion cracking; however, caution should be employed when comparing K sub ISCC values obtained via different test techniques. GRA

N80-19243# National Bureau of Standards, Washington, D.C. Chemical Stability and Corrosion Div.
PASSIVE FILMS, SURFACE STRUCTURE AND STRESS CORROSION AND CREVICE CORROSION SUSCEPTIBILITY Annual Report, Nov. 1977 - Nov. 1978
J. Kruger, J. J. Carroll, A. J. Malmed, J. J. Ritter, and J. R. Ambrose Nov. 1978 37 p refs
(AD-A078596; NBSIR-79-1904; NBS-TSR-9) Avail: NTIS HC A03/MF A01 CSCL 11/3

Field ion microscopy (FIM) is capable of imaging defects such as sub-critical crack formation and growth, and surface rearrangements, and of detecting new surface phase formations, and other disturbances. Thus, we have used the technique to characterize various modes of hydrogen reactions with metal surfaces. Previous work from this laboratory has revealed examples of one mode, the initial crack formation and growth in the hydrogen-titanium and hydrogen-zirconium systems. In each case there were indications of preferential crystallographic attack producing cracks within the metal matrix approximately 10-15 atomic layers deep in the case of titanium, and 2-5 layers deep in the case of zirconium. In the present phase of the work, FIM was used to examine microscopic details of the initial stages of hydrogen interactions with some additional pure metals and metal alloys, i.e., niobium, aluminum, 304 stainless steel and iron-24 wt. chromium steel. The hydrogen-metal interactions occurred during the FIM imaging process with hydrogen pressures between ten to the minus 4th power and ten to the minus 6th power torr at metal temperatures between 20 and 80 K, and while the metal was subjected to stresses brought about by the electric field necessary for imaging the multifacted, approximately hemispherical metal surface. The method used involved comparison of micrographs obtained during inert gas imaging (neon, helium) with micrographs obtained in pure hydrogen or mixtures of hydrogen and inert gases. GRA

N80-19244# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
FORMATION OF POROUS FILMS ON TITANIUM ALLOYS BY ANODIZATION TREATMENTS Final Report, Jul. 1977 - Jul. 1979
William L. Baun Oct. 1979 31 p refs
(AF Proj. 2419)
(AD-A077676; AFML-TR-79-4133) Avail: NTIS HC A03/MF A01 CSCL 11/6

This investigation is part of a program which looks at the effects of surface treatments on surface chemistry and morphology of titanium and titanium alloys. This part considers the effect of surface treatments on the alloy titanium-6 aluminum-4 vanadium which use anodization to produce a porous oxide film. Porous anodized films on titanium alloys have shown to be advantageous for adhesive bonding and other purposes. Porosity may be achieved by increasing current density in the anodization bath by increasing the voltage, increasing the concentration of the electrolyte, increasing the temperature, or adding current carrying ions to the electrolyte. In this work, experiments are described in which each of the methods for increasing current density are accomplished. Characterization results on the surfaces of these anodized oxides are shown using scanning electron microscopy, ion scattering spectrometry, secondary ion mass spectrometry, and Auger electron spectrometry. Addition of lithium nitrate to phthalic acid electrolytes causes porosity in anodized films, but the lithium ions do not enter the oxide film. GRA

N80-19245# Army Materials and Mechanics Research Center, Watertown, Mass.

FATIGUE STRENGTH OF TRIP STEELS Final Report

Gregory B. Olson, Richard Chait, Morris Arzin, and Roger A. Gagne Jun. 1979 16 p refs

(DA Proj. 1L1-62105-AH-84)

(AD-A078592; AMMRC-TR-79-39) Avail: NTIS HC A02/MF A01 CSCL 11/6

Comparison of the S-N curves of warm-extruded TRIP steels, heat treated to give two stabilities with respect to deformation-induced martensitic transformation during testing, reveals a beneficial effect of the transformation on fatigue behavior under stress control conditions. The proportionality of fatigue strength to ultimate tensile strength is maintained to higher strength levels relative to other steels. For a stress ratio of R = 0.1, a fatigue strength at 10 to the seventh power cycles of 180 ksi (1,240 MPa) is obtained. GRA

N80-19246# Pittsburgh Univ., Pa. Dept. of Metallurgical and Materials Engineering.

STRUCTURE AND PROPERTIES OF CAST ALLOYS

Harold D. Brody Sep. 1979 37 p refs

(Contract N00014-75-C-0800)

(AD-A077430; SETEC-MME-79-50) Avail: NTIS HC A03/MF A01 CSCL 11/6

Status of projects related to directional solidification of peritectics, segregration of nickel base superalloys, and casting of NITINOL are summarized. A paper is included which describes work done and needed on modelling of casting processes. GRA

N80-19247# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Materials Engineering.

THE CORROSION FATIGUE BEHAVIOR OF A HIGH PURITY Al-Zn-Mg-Cu ALLOY

Edward F. Smith, III and D. J. Duquette Nov. 1979 213 p refs

(Contract N00014-75-C-0466)

(AD-A077461) Avail: NTIS HC A10/MF A01 CSCL 11/6

The effect of hydrogen on the corrosion fatigue behavior of an Al-5Zn-2.5Mg-1.5Cu alloy was investigated. In the study, a constant mean load (207 MN/sq m), S-N type test method was used to monitor the fatigue response under air and .5N NaCl environments. In both cases, specific experiments were conducted in an attempt to determine the operating failure mechanism. In the air fatigue case, all specimens failed in a transgranular mode. The cyclic stress-strain response of the alloy indicated that the alloy hardened as the fatigue process proceeded to the crack initiation stage. TEM examination of the dislocation substructure indicated a large density of dislocation dipoles in the slip bands. These observations are consistent with debris accumulation model suggested by Duquette and Swann. The model proposes that the accumulation of dipoles within the slip band and will exert an increasing cleavage stress across the slip plane. By using a conservative estimate of the dipole density it is possible to show that the dipole stress may reach levels in excess of 100 MN/sq m. Since this stress is thought to be additive to the applied stress levels, the model provides a plausible failure mechanism. In addition to the laboratory air environment, tests were also performed in an aerated, .5N NaCl solution. In comparison to the air fatigue properties, the tests conducted under open circuit conditions (-.750v vs SCE) resulted in a marked decrease in the fatigue response. These failures were characterized by intergranular initiation leading to a transgranular cleavage type propagation mode. It was found that moderate polarization (to -1.3v SCE) produced little change in the fatigue response. Author (GRA)

N80-19248# Rhode Island Univ., Kingston. Dept. of Ocean Engineering.

HYDROGEN ENTRY AND TRANSPORT MECHANISMS IN STRUCTURAL METALS Final Technical Report

R. Heidersbach, Michael Surkein, Ben Allen, and Jeffrey Jones Nov. 1979 42 p refs

(Grant DAAG29-76-G-0311)

(AD-A078812; TR-1; ARO-14057.4-MS) Avail: NTIS HC A03/MF A01 CSCL 11/6

This report summarizes the results of an investigation into the optimization of the electrochemical hydrogen permeation technique. The results of the research can be summarized as follows: (1) hydrogen permeation fluxes through iron membranes have been demonstrated to be affected by the reactivity of the membrane surfaces. The use of electroplated palladium entry and exit surfaces is recommended if the object of the study is to measure hydrogen mass transfer rates through a ferrous, or similar metal, membrane; (2) the apparent hydrogen diffusivity rates determined in this research are slower than those commonly reported in the literature; (3) diffusivities based on times to reach steady-state could not be calculated for electrochemically-charged membranes because steady-state fluxes were never reached during the one-week duration of the permeation experiments; and (4) an attempted determination of the effects of electroslag remelting on the hydrogen permeability of high strength steels could measure no significant difference between the steels tested. GRA

N80-19249# TRW, Inc., Cleveland, Ohio. Materials Technology.

EXPLORATORY DEVELOPMENT OF DIE MATERIALS FOR ISOTHERMAL FORGING OF TITANIUM ALLOYS Final Technical Report, 1 May 1978 - 30 Apr. 1979

Charles S. Kortovich and James M. Marder Jul. 1979 188 p refs

(Contract F33615-76-C-5105; AF Proj. 7351)

(AD-A078951; AFML-TR-79-4092) Avail: NTIS HC A09/MF A01 CSCL 11/6

A program was conducted to develop materials for isothermal forging dies exhibiting higher yield strength and creep resistance than currently used nickel-base superalloy and molybdenum alloy compositions. The technical approach involves two phases, the first including alloy development aimed towards improved casting, powder metallurgy and metastable carbide alloy compositions and the second including the fabrication of tooling of the most promising die material/process for the F-15 trunnion drag brace arresting gear. The alloy development study included the evaluation of TRW-NASA VIA, TAZ-8A, IN-792 and IN-100 in terms of tensile, creep rupture and thermal fatigue tests as well as lubricant compatibility tests with typical isothermal forging lubricants. The results indicated that a modified TRW-NASA VIA casting composition offered the greatest potential for applicability as a die material. GRA

N80-19250# Southeastern Center for Electrical Education, Inc., Auburn, Ala.

REPRESENTATION OF TIME DEPENDENT MECHANICAL BEHAVIOR OF RENE 95 BY CONSTITUTIVE EQUATIONS Final Report, Aug. - Oct. 1978

Sol R. Bodner (Technion-Israel Inst. of Tech.) Aug. 1979 40 p refs Submitted for publication

(Contract F33615-77-C-5003)

(AD-A077271; AFML-TR-79-4116) Avail: NTIS HC A03/MF A01 CSCL 11/6

The constitutive equations of Bodner-Partom are utilized to represent the time dependent inelastic properties of Rene 95 at 1200 F (649 C) over a wide range of uniaxial loading conditions. These include controlled monotonic straining, creep, stress relaxation, and cyclic loading. The material constants are obtained from a few test points and are used to calculate response

characteristics which are compared to corresponding test results. Some general conclusions on the inelastic behavior of Rene 95 are discussed. GRA

N80-19251# Ocean City Research Corp., N.J.
CORROSION OF ALUMINUM ALLOYS IN HIGH VELOCITY SEAWATER Final Report, Jul. 1978 - Jul. 1979
G. A. Gehring, Jr. Nov. 1979 47 p refs
(Contract N00014-78-C-0720)
(AD-A078435; OCR-ONR-3) Avail: NTIS HC A03/MF A01 CSCL 11/6

A study was undertaken to examine the corrosion behavior of selected aluminum alloys in high velocity seawater. The work is pertinent to the development of high speed ships by the U.S. Navy. The selected aluminum alloys included 1100-H14 and 5456-H117. Plate specimens of each alloy were exposed in a flow channel at test velocities ranging from 3 to 30 m/s. The affect of cathodic polarization on the velocity-related corrosion behavior of the 5456 alloy was also investigated. Under the flow conditions established in the study, the results show that: (1) both the rate and mode of corrosion are velocity-dependent for aluminum alloys; (2) velocity-related shifts in corrosion potential can occur; (3) polarization resistance measurements are inadequate for predicting corrosion rates of aluminum alloys in high velocity flow; (4) cathodic protection cannot retard velocity-induced corrosion of aluminum alloys; (5) cathodic polarization will tend to accelerate corrosion of aluminum alloys at all velocities tested; and (6) at higher velocities, the predominant reduction reaction associated with the corrosion of aluminum alloys is H2O plus le give OH - plus 1/2 h(2). GRA

N80-19252# Inco Research and Development Center, Suffern, N. Y.
ALLOY DEVELOPMENT OF OXIDE DISPERSION STRENGTHENED HIGH VOLUME GAMMA NICKEL-BASE SUPERALLOYS MADE BY MECHANICAL ALLOYING Final Report, Jun. 1978 - Jun. 1979
R. C. Benn Jul. 1979 65 p refs
(Contract N62269-78-C-0200)
(AD-A077615; Rept-4078.4) Avail: NTIS HC A04/MF A01 CSCL 11/6

The object of this work was to develop ODS alloys which would derive a significant high temperature strength increment from the retention of high volume fractions (=50%) of gamma: at 2000 F (1093 C). Alloy structure and property investigations were conducted to determine the effects of W, Mo, Ta and Nb combinations substituted on an atomic weight basis into each of three Ni-Cr-Al ternary systems. Specifically, Cr:Al levels of 15:16, 12.5:17.5 and 10:17.5 at .% were chosen. Based on promising directional recrystallized structures and mechanical properties, three alloys were selected from the series of 12 compositions, for further development including the effects of B/Zr alloy modifications, extrusion, hot rolling and heat treatment studies on the directional recrystallization response, structure and mechanical properties. The work confirmed that the high volume fraction of gamma, characteristic of these alloys, is an effective means of improving the intermediate temperature strength of ODS superalloys. GRA

N80-19253# American Chemical Society, Washington, D. C.
PROCEEDINGS OF THE NATIONAL SYMPOSIUM ON WEAR AND CORROSION Final Report, 1 May - 30 Sep. 1979
Robert S. Shane Jun. 1979 98 p refs Symp. held in Washington, D.C., 4-6 Jun. 1979
(Contract F49620-79-C-0082; AF Proj. 2303)
(AD-A077406; AFOSR-79-1139TR) Avail: NTIS HC A05/MF A01 CSCL 11/6

This symposium on wear and corrosion included a specialized session which addressed corrosion from the viewpoints of economics, research direction, regulation, and standardization, as well as the technical viewpoints of coatings, inhibitors cathodic and anodic protection, and the selection of materials for design. The wear session includes papers on automotive problems, gas path seals, energy development, and material processing. GRA

N80-19254# Rockwell International Science Center, Thousand Oaks, Calif.
SURFACE TREATMENT FOR ALUMINUM BONDING Final Technical Report, 28 Jul. 1978 - 15 Jul. 1979
Tennyson Smith Oct. 1979 212 p refs
(Contract DAAK10-78-C-0274)
(AD-A076950; SC5180.17FTR) Avail: NTIS HC A10/MF A01 CSCL 11/6

At present the most widely used method for treating aluminum prior to bonding is the sulfochrom etch process (FPL etch). Due to the carcinogenic nature of chromates, various companies and government agencies have been attempting to find new durable nonchromate-containing systems which can be used to treat aluminum prior to bonding. The objective of this project was to discover a nonacid (nonchromate) surface treatment for Al 2024-T3 that would be both strong and durable. Initial studies indicated that a simple degrease and water soak process (STAB(1)) would provide strong durable joints. However, further testing revealed this process to be hard to reproduce on a consistent basis. A second process (STAB(2)) was discovered that was equally as simple but was also difficult to reproduce. A third process, even more simple (STAB(3)) was discovered which did prove reproducible. This process eliminates the degrease step and involves no energy input (room temperature dip in super-concentrated sodium hydroxide). There are only three steps involved, a sodium hydroxide solution dip, a rinse and dry. This report gives the details of these three processes, the bond strength and endurance results and why each process did or did not work satisfactorily. Author (GRA)

N80-19255# Du Pont de Nemours (E. I.) and Co., Aiken, S. C.
HYDROGEN EFFECTS ON FLOW LOCALIZATION AND FRACTURE IN TYPE 304L STAINLESS STEEL
G. R. Caskey 1979 10 p Presented at Gordon Res. Conf., Andover, N.H., 9-13 Jul. 1979
(Contracts EY-76-C-09-0001; ATI07-2)-1)
(DP-MS-79-57; CONF-790773-1) Avail: NTIS HC A02/MF A01

The onset of plastic instability, localization of plastic flow, and fracture in type 304L austenitic stainless steel are modified by the presence of hydrogen. It is not certain, however, whether the observed changes in behavior are attributable to the direct effect of hydrogen on plastic flow or to the intervention of a hydrogen-induced brittle fracture process. The affects are observed in both smooth bar and single edge notched specimens and are dependent on deformation temperature. DOE

N80-19256# Bendix Corp., Kansas City, Mo.
MECHANICAL PROPERTIES OF ELECTROPLATED NICKEL RINGS FOR BATH AGING STUDY
P. M. Heffley Nov. 1979 17 p ref
(Contract EY-76-C-04-0613)
(BDX-613-2303) Avail: NTIS HC A02/MF A01

Hydraulic burst tests were performed on electroplated nickel rings as part of a bath aging study. Ring tensile properties were measured. An invalid failure mechanism was observed for rings having a significant gradient in wall thickness over the height. Finite element method stress analysis models established the probable cause and helped set limits for future specimen dimension tolerances. DOE

N80-19257# National Technical Information Service, Springfield, Va.
STRESS CORROSION OF STAINLESS STEELS, VOLUME 2. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1974 - Nov. 1979
William E. Reed Dec. 1979 339 p Supersedes NTIS/PS-78/1340; NTIS/PS-77/1187; NTIS/PS-76/1018
(PB80-803208; NTIS/PS-78/1340; NTIS/PS-77/1187; NTIS/PS-76/1018) Avail: NTIS HC $30.00/MF $30.00 CSCL 11F

Worldwide research on stainless steel stress corrosion and stress corrosion resistant steels are covered in this report. Stress corrosion cracking and fatigue are studied. In addition, studies on electrochemistry, phase studies, environments, processing, and testing are included. Stainless steel performance in chemical plants, nuclear reactors, and biological implants is discussed. This updated bibliography contains 333 abstracts, 72 of which are new entries to the previous edition. GRA

N80-19258/ National Technical Information Service, Springfield, Va.
STRESS CORROSION OF STAINLESS STEELS. VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1977 - Nov. 1979
William E. Reed Dec. 1979 117 p Supersedes NTIS/PS-78/1339; NTIS/PS-77/1186; NTIS/PS-76/1016; NTIS/PS-75/786
(PB80-803190; NTIS/PS-78/1339; NTIS/PS-77/1186; NTIS/PS-76/1016; NTIS/PS-75/786) Avail: NTIS HC $30.00/MF $30.00 CSCL 11F

This compilation covers research on deformation, cracking, electrochemistry, additives, kinetics, test methods and solutions in relation to stress corrosion. A majority of the research concerns nuclear reactor materials, spacecraft components, and coal gasification plants. Design criteria and corrosion resistance are also discussed. This updated bibliography contains 111 abstracts, 36 of which are new entries to the previous edition. GRA

N80-19259/ National Technical Information Service, Springfield, Va.
POWDER METALLURGY OF ALUMINUM. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Dec. 1979
William E. Reed Dec. 1979 199 p Supersedes NTIS/PS-78/1310; NTIS/PS-77/1096; NTIS/PS-76/0957; NTIS/PS-75/697 2 Vol.
(PB80-803216; NTIS/PS-78/1310; NTIS/PS-77/1096; NTIS/PS-76/0957; NTIS/PS-75/697) Avail: NTIS HC $30.00/MF $30.00 CSCL 11F

The citations cover Government-sponsored research involving aluminum and aluminum alloy powder compaction, pressing, sintering, joining, and heat treatment. Studies on mechanical properties and structure are included. The fabrication and testing of products are also cited. This updated bibliography contains 192 abstracts, 30 of which are new entries to the previous edition. GRA

N80-19260/ National Technical Information Service, Springfield, Va.
POWDER METALLURGY OF ALUMINUM. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Dec. 1979
William E. Reed Dec. 1979 314 p Supersedes NTIS/PS-78/1311; NTIS/PS-77/1097; NTIS/PS-76/0958 2 Vol.
(PB80-803224; NTIS/PS-78/1311; NTIS/PS-77/1097; NTIS/PS-76/0958) Avail: NTIS HC $30.00/MF $30.00 CSCL 11F

Worldwide research on powder metallurgy of aluminum and aluminum alloys are cited in the bibliography. Studies on sintering, pressing, fabrication, dispersion hardening, compacting, and testing are included. Processes such as welding, reinforcement, and powder production are also covered. This updated bibliography contains 307 abstracts, 10 of which are new entries to the previous edition. GRA

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N80-19261 British Library Lending Div., Boston Spa (England).
ACTIVATION BY MEANS OF COLLOIDAL PALLADIUM IN THE ELECTROPLATING OF ABS COPOLYMERS. 2: THE NATURE OF THE PALLADIUM/TIN (2) CHLORIDE ACTIVATING SOLUTION
Chr. Petrov, M. Entsheva, and A. Lirkov Oct. 1979 27 p refs Transl. into ENGLISH from Metalloberflaeche (West Germany), v. 33, no. 2, 1979 p 68-74
(BLL-RTS-11924) Avail: British Library Lending Div., Boston Spa, Engl.

A radiochemical technique was used to record: (1) the change in concentrate aging brought about by the addition of a large excess of solid tin (2) chloride to the hydrochloric acid/palladium chloride solution; and (2) the effect of washing with water and with organic solvents on an activated plastic surface. The data emphasize the colloidal nature of the concentrate and the activating solutions prepared from it. A mechanism is proposed for the processes taking place between preparation of the concentrate and placing activated plastic test pieces in the accelerating solution. K.L.

N80-19262 British Library Lending Div., Boston Spa (England).
WAYS TO INORGANIC POLYMERS
J. Hansmann Oct. 1979 25 p refs Transl. into ENGLISH from Gummi, Asbest, Kunstst. (West Germany), v. 29, no. 7, 1976 p 440-449
(BLL-RTS-11805) Avail: British Library Lending Div., Boston Spa, Engl.

The essential molecular structural elements for material properties can be divided into the following groups: molecular properties; chain length and chain length distribution; strengthening and loosening of the super-molecular structure, especially by additives; texture (all materials of super-molecular order); and molecular movement in the body. Polymers are considered in terms of priority from the viewpoints of chemical structure (type and bonding of the atoms or groups) and of the form, size, and order of the macromolecule. A.R.H.

N80-19263*/ National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPARISON OF THE TRIBOLOGICAL PROPERTIES AT 25 C OF SEVEN DIFFERENT POLYIMIDE FILMS BONDED TO 301 STAINLESS STEEL
Robert L. Fusaro Feb. 1980 25 p refs
(NASA-TM-81413; E-328) Avail: NTIS HC A02/MF A01 CSCL 11G

A pin-on-disk type of friction and wear apparatus was used to study the tribological properties of seven different polyimide films bonded to AISI 301 stainless steel disks at 25 C. It was found that the substrate material was extremely influential in determining the lubricating ability of the polyimide films. All seven films spalled in less than 1000 cycles of sliding. This was believed to be caused by poor adherence to the 301 stainless steel or the inability of the films to withstand the high localized tensile stresses imparted by the deformation of the soft substrate under sliding conditions. The friction coefficients obtained for six of the polyimides varied between 0.21 to 0.32 while one varied between 0.32 to 0.39. K.L.

N80-19264*/ National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
EVALUATION OF SRM FLEX BEARING MATERIALS AND PROCESSES
Thomas E. Wood Feb. 1980 20 p
(NASA-TM-78266) Avail: NTIS HC A02/MF A01 CSCL 11A

Tensile, peel, and shear testing was performed on combinations of primers, adhesives, tycements and rubber compounds cured at various times and temperatures. The materials used in the fabrication of the solid rocket motor flex bearing as well as in other systems were evaluated. A compatibility study between adhesives and tycements was initiated. The flex bearing mold design was reviewed by our tooling experts. R.C.T.

N80-19265/ Royal Aircraft Establishment, Farnborough (England).
FORMATION OF ORGANOSILICON COMPOUNDS. 58: SYNTHESIS OF A CARBOSILANE WITH PROPELLANE STRUCTURE
G. Fritz and H. J. Vogt Sep. 1979 14 p refs Transl. into ENGLISH from Z. Anorg. Allg. Chem. (East Germany), v. 419, no. 1, 1976 p 2-8
(RAE-Lib-Trans-2029; BR71984) Avail: NTIS HC A02/MF A01

The organometallic synthesis of carbosilanes is reported. The synthesis of a carbosilance with propellane structure based on the coupling of four SiBr groups with CC14 ab by lithium is described. The most favorable conditions for the coupling reaction with CC14 are discussed along with the properties of the resulting compound. J.M.S.

N80-19268# Naval Postgraduate School, Monterey, Calif.
ACCURACY AND REPEATABILITY INDICES FOR JOINT OIL ANALYSIS PROGRAM DATA M.S. Thesis
Douglas Carlton Hatcher Sep. 1979 49 p refs
(AD-A078156) Avail: NTIS HC A03/MF A01 CSCL 11/8

This thesis examines spectrometric oil analysis data in an attempt to construct tables of statistical estimates for use in evaluating a laboratory's performance individually and in comparison to control laboratory. Tables of estimates were obtained from data provided by twenty six laboratories. GRA

N80-19267# Naval Research Lab., Washington, D. C. Ceramics Branch.
FAILURE CAUSING DEFECTS IN CERAMICS: WHAT NDE SHOULD FIND Interim Report
R. W. Rice, J. J. Mecholsky, S. W. Freiman, and S. M. Morey 30 Oct. 1979 37 p
(AD-A078234; NRL-MR-4075) Avail: NTIS HC A03/MF A01 CSCL 11/2

The various types of defects causing failure in a variety of ceramic materials are illustrated. Examples are drawn from such ceramics as piezoelectric, infrared transmitting and potential turbine materials. Both machining and processing defects are shown as sources of failure. The former are selected to illustrate the effects of machining parameters. Processing defects illustrated include pores, foreign particles and large grains, or clusters of these. Changes in the size of defects with specimen size are also noted. GRA

N80-19268# Douglas Aircraft Co., Inc., Long Beach, Calif.
PRIMARY ADHESIVELY BONDED STRUCTURE TECHNOLOGY (PABST). GENERAL MATERIAL PROPERTY DATA Final Report, Feb. 1975 - Sep. 1978
R. W. Shannon, P. Stifel, R. Beger, E. J. Hughes, and J. L. Rutherford Wright-Patterson AFB, Ohio AFFDL Sep. 1978 408 p
(Contract F33615-75-C-3016)
(AD-A077891; MDC-J6065A; AFFDL-TR-77-107) Avail: NTIS HC A18/MF A01 CSCL 11/1

This program investigated state-of-the-art adhesives, adhesive primers, surface treatments, and coatings to determine, through durability testing, a system that could be used to adhesively bond a primary aircraft structure. Test methods were also evaluated. Previous work indicated cyclic-stressed testing in hostile environments and, specifically, high moisture environments reduced the life and durability of a given adhesive system over the same system load to the same level at constant stress. Conclusions include: (1) stressed durability testing is required to determine if a given surface treatment is durable; (2) normal industry accepted processing tolerances on surface treatments are too wide to produce consistently durable bonded joints; (3) handling of surface treated details must be designed to prevent mechanical damage and contamination; (4) phosphoric acid anodize process was the surface treatment most tolerant to processing variations and inspectable; (5) adhesive primers from different suppliers demonstrated a large variation in environment resistance and corrosion protection capabilities; (6) the type of carrier used in adhesive films has a large effect on the moisture resistance of the adhesives; and (7) cyclic stressed testing in a hostile environment is necessary to determine the optimum adhesive durability. GRA

N80-19269# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.
COMPARISON OF CRYSTALLINITY AND MOLECULAR ORIENTATION BETWEEN SURFACE AND BULK OF SOME POLYMERS BY FTIR-ATR AND TRANSMISSION SPECTROSCOPY
M. K. Tse and C. S. Paik Sung Nov. 1979 15 p refs Presented at the Symp. on Spectroscopic Characterization of Mol. Struct. at Polymer Surfaces and Interfaces, Houston, Tex. Mar. 1980 Submitted for publication
(Contract N00014-78-C-0676)
(AD-A078243; TR-2) Avail: NTIS HC A02/MF A01 CSCL 11/9

Fourier transform IR transmission and multiple internal reflection spectroscopy were used to characterize polyethylene and polypropylene surfaces and to compare with their bulk properties in regard to the degree of crystallinity and molecular orientation. Surface crystallinity of the cold drawn polyethylene and polypropylene samples is found to be similar to the bulk crystallinity values. In order to improve accuracy of the surface orientation measurement, a new rotatable sample holder, which utilizes a double-edged square parallelogram rather than conventional single-edged rectangular trapezoidal plates was designed. This enables the polymer film to be mounted and rotated orthogonally while maintaining identical contact. As a result, the three optical constants, kx, ky, and kz can be determined by using four equations, thus providing a check on the reliability of the data. Preliminary results obtained with this new sample holder indicate that the surface of cold drawn polyethylene has lower orientation than bulk, while similar orientation values were observed when comparing the surface with the bulk of cold drawn polypropylene. GRA

N80-19270# Texas A&M Univ., College Station. Dept. of Chemistry.
CHARACTERIZATION AND ANALYSIS OF REACTIVE ORGANOMETALLIC POLYMERS
David E. Bergbreiter and James M. Killough 1 Dec. 1979 14 p refs
(Contract N00014-77-C-0426)
(AD-A078184; TR-4) Avail: NTIS HC A02/MF A01 CSCL 11/9

Lithiated cross-linked insoluble polystyrene polymers have been prepared by several different procedures and analyzed. The chromatographic analyses which have been developed for these organometallic polymers can accurately quantitate even small amounts of organolithium species. This analytical procedure is based on the reaction of 1,2-dibromodecane with polystyryllithium which generates an amount of 1-decene equal to the amount of polymeric lithium reagent. By analysis of other reaction products such as 1-bromobutane, adsorbed n-butyllithium reagent can be distinguished from polymeric lithium reagent. Evidence for adsorption of soluble alkyl-lithium reagent by polymeric organolithium reagent is also presented. Author (GRA)

N80-19271# Air Force Packaging Evaluation Agency, Wright-Patterson AFB, Ohio.
EVALUATION OF A POLYURETHANE/POLYSTYRENE COMPOSITE CUSHIONING MATERIAL
Frank C. Jarvis Jul. 1979 21 p
(AD-A077918; PTPT-79-2) Avail: NTIS HC A02/MF A01 CSCL 11/9

An evaluation of a polyurethane/polystyrene composite cushioning material revealed that the dynamic cushioning characteristics of this material has a broader static stress range, for a specific peak acceleration, than some of the existing 2 pcf materials listed in the Military Handbook 304A, 'Package Cushioning Design'. Samples of materials identified as structural grade and cushioning grade together with intermediate grades of material formulations, were analyzed to determine the effect of the expanded polystyrene beads in the material formulation. GRA

N80-19272# Massachusetts Inst. of Tech., Cambridge.
SURFACE CHEMICAL COMPOSITION - DEPTH PROFILE OF POLYETHER POLYURETHANEUREAS AS STUDIED BY FT-IR AND ESCA
C. B. Hu and C. S. Paik Sung Nov. 1979 18 p refs Presented at the Symp. on the Spectroscopic Characterization of Mol. Struct. at Polymer Surfaces and Interfaces, Houston, Tex., Mar. 1980 Submitted for publication
(Contract N00014-78-C-0676)
(AD-A078240; TR-1) Avail: NTIS HC A02/MF A01 CSCL 07/3

Chemical composition-depth profile in the range covering 100 A to 2 micron was obtained with well-characterized polyether poly(urethaneurea) elastomers by combining FT-IR internal reflection technique with ESCA. In FT-IR technique, either the incident angle of the internal reflection attachment was changed or a thin film, which is transparent to most of IR radiation, was cast directly on the reflection plate to reduce the depth of the IR beam penetration in order to obtain surface chemical composition at various depths. Our results show that the flexible, soft segment is more abundant on the surfaces, especially at

the air facing surface, as compared with the bulk composition. This trend is observed not only in the first 100 A, but also into a much deeper depth, such as 1 micron. Our results suggest that the migration of oligomers (approximately 5000 MW) such as trimers or pentamers, which have soft segments at both ends is responsible for the observed high content of soft segment on the surface. The presence of the oligomers are indicated by GPC and the extraction studies support that they have higher content of soft segment when compared with the bulk composition. GRA

N80-19273# Case Western Reserve Univ., Cleveland, Ohio.
HIGHLY CONDUCTING IODINATED FLUOROALUMINUM AND FLUOROGALLIUM PHTHACCYANINE POLYMERS Technical Report, 1 Jan. 1979 - 1 Jan. 1980
Paul M. Kuznesoff, Kenneth J. Wynne, Ronald S. Nohr, and Malcolm E. Kenney 1 Jan. 1980 13 p refs
(Contract N00014-75-C-0693)
(AD-A078188; TR-5) Avail: NTIS HC A02/MF A01 CSCL 07/4

Partial oxidation of the quasi-one dimensional fluoroaluminum and fluorogallium phthalocyanines with iodine yields species with appreciable electrical conductivities (1/0.01-1 ohm/centermeters); thermogravimetric, Raman spectroscopic, and mass spectrometric techniques have provided useful information about their compositions and nature. GRA

N80-19274# Akron Univ., Ohio. Inst. of Polymer Science.
EFFECT OF NUMBER OF CHEMICAL BONDS ON THE STRENGTH OF ADHESION BETWEEN GLASS AND POLYBUTADIENE
P. Dreyfuss, Y. Eckstein, O. S. Lien, and H. H. Dollwet Dec. 1979 23 p refs
(Contract N00014-76-C-0408)
(AD-A078237; TR-6) Avail: NTIS HC A02/MF A01 CSCL 13/5

Studies of the effect of chemical bonding on the joint strength of bonds formed between polybutadiene and glass were carried out. The number of chemical bonds was determined using 14 C labelled interfacial bonds and measuring the resulting radioactivity. The strength of the joint was found to increase as the number of chemical bonds increases. The presence of essentially all the radioactivity on the glass surface after peeling at 180 degrees indicated that fracture occurred without breaking the interfacial bonds. GRA

N80-19275# Harry Diamond Labs., Adelphi, Md.
VISCOELASTIC POLYMER FOR PRINTED-CIRCUIT-BOARD VIBRATION DAMPING
Mark R. Probst Sep. 1979 14 p
(DA Proj. 1L4-63317-D-112)
(AD-A077803; HDL-TM-79-22) Avail: NTIS HC A02/MF A01 CSCL 09/1

A viscoelastic polymer was selected as a possible means of vibration damping for electronic printed-circuit-board (PCB) assemblies in a surface-to-air guided-missile application. Thin layers of the self-adhesive polymer were bonded to dummy and real PCB assemblies, and accelerations were recorded at various PCB locations during sinusoidal vibration tests. For input levels of 1 and 2 g and logarithmic frequency sweeps from 10 to 2500 Hz, peak resonant acceleration levels were reduced to 15 percent of the peak levels recorded under the same conditions with no damping layers added. GRA

N80-19276# Pennwalt Corp., King of Prussia, Pa. Central Research and Development Dept.
THE CRYSTALLIZATION THERMODYNAMICS OF PIEZOELECTRIC COPOLYMERS
Harry Stefanou Nov. 1979 25 p refs
(Contract N00014-77-C-0130)
(AD-A078705; TR-2) Avail: NTIS HC A02/MF A01 CSCL 09/1

The crystallization of piezoelectric vinylidene fluoride-tetrafluoroethylene and vinylidene fluoride-hexafluoropropylene copolymers was investigated. Several compositions of each copolymer were synthesized and the melting point depression was evaluated as a function of composition. Models were examined in which the comonomers were included as defects in the crystal lattice or in which they were excluded. The need to use several approaches before a conclusion can be reached is clearly seen. Our studies indicate that the exclusion model is a less accurate description of the crystallization of these two copolymers. Values for the enthalpy of defect incorporation are evaluated and shown to be reasonable. GRA

N80-19277# Naval Research Lab., Washington, D. C. Ceramics Branch.
MACHINING FLAWS AND THE STRENGTH GRAIN SIZE BEHAVIOR OF CERAMICS Interim Report
R. W. Rice 28 Sep. 1979 28 p refs
(NRL Proj. M05-12; NRL Proj. P03-19)
(AD-A077536; AD-E000335; NRL-MR-4076) Avail: NTIS HC A03/MF A01 CSCL 11/2

A model for the strength-grain size dependence of ceramics failing from machining flaws is presented based on the observation that the size of machining flaws (C) shows little or no dependence on grain size. Two regimes of behavior are seen. At finer grain sizes, little or no strength dependence on grain size (G) exists because flaws are greater than G. For large G, the significant decrease of strength with increasing G is attributed by a transition from polycrystalline to either lower single crystal or grain boundary (i.e. bicrystal) fracture energies as the approximate constant (C) becomes significantly less than G as G increases. The transition between the two regimes is when C and G are similar. Extensive analysis of strength-grain size data, and more limited directly correlated fractographic data support the proposed model. Spontaneous cracking in non-cubic materials is shown to support the model, but not be an alternate explanation for the transitions seen in machined Al2O3 or BeO. This analysis also further supports the observation that machining flaws do not vary greatly with typical variations in machining parameters. Author (GRA)

N80-19278# Naval Air Propulsion Test Center, Trenton, N.J. Propulsion Technology and Project Engineering Dept.
EFFECT OF ENGINE OPERATING ENVIRONMENTS ON LUBRICANT LOAD CARRYING CAPACITY OF HIGH GEAR LOAD OILS Final Report
P. J. Mangione Nov. 1979 34 p refs
(W0598000)
(AD-A078421; NAPC-PE-28) Avail: NTIS HC A02/MF A01 CSCL 21/5

Load carrying capacity evaluations were made on current and advanced esterbased synthetic lubricants which were exposed to the operating environments of gas turbine engines. The program also investigated the cause/effect of changes in load carrying capacity as related to additive depletion and possible additive/metal interaction through an adsorption or reactive process. The results indicated that both current oils and advanced high gear load oils experienced significant degradation in load carrying capacity with time in both engine and simulated engine bearing compartment environments. The percentage loss in load carrying capacity was greater with the high gear load oils, but neither oil was significantly influenced by the engine type sampled. However, the absolute rating of the degraded XAS-2354 oil remained above the degraded MIL-L-23699 oil absolute ratings. The lower load carrying capacity of used oils, attributed to additive depletion, appeared to be recoverable with new oil additions of a high gear load oil. However, this capability would not be realized in normal operation of an engine lubrication system. An effective pre-conditioning treatment of gear tooth surfaces with a high gear load oil was demonstrated and recommended for use in the 'run-in' of new or overhauled helicopter gearboxes for improved resistance to surface damage and extended service life. GRA

N80-19279# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Macromolecular Science.
CONDUCTION IN POLYDIACETYLENE BILAYERS
David R. Day and Jerome B. Lando Dec. 1979 17 p refs
(Contract N00014-77-C-0213)
(AD-A078755; TR-2) Avail: NTIS HC A02/MF A01 CSCL 11/9

Diacetylene monolayers polymerized at the gas water interface have a very poor conductivity. They do however exhibit a photoconductive and doping effect which can raise the conductivity over three orders of magnitude. Because of the initially low

conductivity, the polydiacetylene monolayers could at best only be considered a poor semiconductor after doping. The possibility still remains that more exotic dopants such as AsF5 that are successfully applied to other conjugated polymers may result in higher conductivities in polydiacetylene monolayers. GRA

N80-19280# Dayton Univ. Research Inst., Ohio.
DEVELOPMENT OF SURFACE INTERACTIONS AT POLYMER-METAL INTERFACES Final Report, 1 Apr. 1976 - 5 Apr. 1979
J. S. Solomon, D. L. Hall, and D. E. Hanlin Aug. 1979 139 p refs
(Contract F33615-76-C-5185; AF Proj. 7340)
(AD-A077276; UDR-TR-79-41; AFML-TR-79-4100) Avail: NTIS HC A07/MF A01 CSCL 11/6

Contents: Introduction; Metal Adherend Surfaces-Aluminum Alloys - Oxide Characterization; Elemental Distribution - Phosphorus, Copper, Magnesium; Titanium Alloys; Graphite Fibers; Bond Joint Characterization; Instrumental Modification--Secondary Ion Mass Spectroscopy, and Auger Electron Spectroscopy. GRA

N80-19281# Naval Research Lab., Washington, D. C.
THE EFFECT OF SEAWATER ON POLYMERS Interim Report
G. R. Baker and C. R. Thompson Nov. 1979 32 p refs
(NRL Proj. S02-43.801)
(AD-A077324; NRL-MR-4097) Avail: NTIS HC A03/MF A01 CSCL 11/9

The extent of interaction between a fluid and a polymer is monitored by changes in weight, dimension, and hardness. Results of the measurements reports reported here show that the type of interactions are dependent upon the specific material. Some materials undergo a simple diffusion process, while others interact in a complex manner, with several processes occurring simultaneously. Those materials that exhibit complex behavior require further study with appropriate end-use tests. GRA

N80-19282# Naval Surface Weapons Center, White Oak, Md. Research and Technology Dept.
MOISTURE EFFECTS ON THE MECHANICAL PROPERTIES OF HERCULES 3501-6 EPOXY RESIN Progress Report, Oct. 1977 - Oct. 1978
Joseph M. Augl Mar. 1979 47 p
(WR0220401)
(AD-A078616; NSWC/TR-79-41) Avail: NTIS HC A03/MF A01 CSCL 11/9

The following properties of the Hercules 3501-6 epoxy resin were determined: Young's modulus, shear modulus, Poisson's ratio, ultimate strength, and ultimate strain, all as a function of temperature (between 21 and 150 C) and as a function of moisture concentration corresponding to an equilibrium concentration from 0-100 percent relative humidity. The purpose of this investigation was to obtain the necessary constituent material property data for predicting the environmental response of 3501-6 carbon fiber reinforced composites. GRA

N80-19766# Joint Publications Research Service, Arlington, Va.
RAPID LABORATORY METHOD FOR TESTING OUTGASSING OF THERMOSTABLE PLASTICS AND RUBBER
V. D. Yablochkin, G. D. Solomin, V. A. Shchirskaya, N. A. Glazkova, Ye. A. Demchenko, N. Ye. Ostasheva, and E. I. Chukhno *In its* USSR Rept.: Space Biol. and Aerospace Med., V. 14, No. 1, (JPRS-75251) 5 Mar. 1980 p 73-79 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 50-54 (For primary document see N80-19755 10-51)
Avail: NTIS HC A07/MF A01

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N80-19283*# Pennsylvania State Univ., University Park.
EVALUATION OF A LOCALLY HOMOGENEOUS FLOW MODEL OF SPRAY COMBUSTION Final Report
C-P. Mao, G. A. Szekely, Jr., and G. M. Faeth Washington NASA Apr. 1980 55 p refs
(Grant NGR-39-009-077)
(NASA-CR-3202) Avail: NTIS HC A04/MF A01 CSCL 21B

A model of spray combustion which employs a second-order turbulence model was developed. The assumption of locally homogeneous flow is made, implying infinitely fast transport rates between the phase. Measurements to test the model were completed for a gaseous n-propane flame and an air atomized n-pentane spray flame, burning in stagnant air at atmospheric pressure. Profiles of mean velocity and temperature, as well as velocity fluctuations and Reynolds stress, were measured in the flames. The predictions for the gas flame were in excellent agreement with the measurements. The predictions for the spray were qualitatively correct, but effects of finite rate interphase transport were evident, resulting in a overstimation of the rate development of the flow. Predictions of spray penetration length at high pressures, including supercritical combustion conditions, were also completed for comparison with earlier measurements. Test conditions involved a pressure atomized n-pentane spray, burning in stagnant air at pressures of 3, 5, and 9 MPa. The comparison between predictions and measurements was fair. This is not a very sensitive test of the model, however, and further high pressure experimental and theoretical results are needed before a satisfactory assessment of the locally homogeneous flow approximation can be made. Author

N80-19284*# Southwest Research Inst., San Antonio, Tex. Mobile Energy Div.
FUEL QUALITY COMBUSTION ANALYSIS Final Report, 6 Oct. 1978 - Jul. 1979
D. W. Naegeli and C. A. Moses May 1979 50 p refs
(Contract NAS3-21587)
(NASA-CR-162822; MED113) Avail: NTIS HC A03/MF A01 CSCL 21D

A high pressure research combustor operating over a wide range of burner inlet conditions was used to determine the effects of fuel molecular structure on soot formation. Six test fuels with equal hydrogen content (12.8%) were blended to stress different molecular components and final boiling points. The fuels containing high concentrations (20%) of polycyclic aromatics and partially saturated polycyclic structures such as tetralin, produced more soot than would be expected from a hydrogen content correlation for typical petroleum based fuels. Fuels containing naphthenes such as decalin agreed with the hydrogen content correlation. The contribution of polycyclic aromatics to soot formation was equivalent to a reduction in fuel hydrogen content of about one percent. The fuel sensitivity to soot formation due to the polycyclic aromatic contribution decreased as burner inlet pressure and fuel/air ratio increased. R.C.T.

N80-19285# Gough (Paul) Associates, Inc., Portsmouth, N.H.
TWO DIMENSIONAL CONVECTIVE FLAMESPREADING IN PACKED BEDS OF GRANULAR PROPELLANT Final Report, Nov. 1977 - Feb. 1979
Paul S. Gough Jul. 1979 159 p refs
(Contract DAAK11-78-C-0003; DA Proj. 1L1-61102-AH-43)
(AD-A075326; AD-E430304; PGA-TR-79-1; ARBRL-CR-00404) Avail: NTIS HC A08/MF A01 CSCL 19/4

A theoretical model is described for the digital simulation of flamespreading and pressure-wave propagation in axisymmetric, two dimensional propelling charges. The approach recognizes explicitly the presence of internal boundaries defined by jumps in porosity and allows for treatment of the influence of bag materials, liners, and additives on flamespreading. As one step toward the implementation of this model, a technique of numerical solution is presented for a geometrically complex region of two dimensional, two phase flow. Solutions are presented for three problems based on nominal data. GRA

N80-19286# George Washington Univ., Washington, D. C. Dept. of Chemistry.
MECHANISTIC STUDIES OF THE EFFECT OF LEAD SALTS ON DOUBLE BASE PROPELLANT COMBUSTION. THE USE

OF MODEL SYSTEMS Final Report, 1 Nov. 1975 - 31 Jul. 1979
Joseph B. Levy Sep. 1979 37 p refs
(Grant DAAG29-76-G-0087)
(AD-A075371; ARO-13249.1-CI) Avail: NTIS
HC A03/MF A01 CSCL 21/9

In this program the effects of lead oxide (PbO) on the thermal decomposition of n-propyl nitrate have been studied as a model for double-base propellants containing lead salts as ballistic modifiers. Only a small effect has been observed with n-propyl nitrate at the temperature range investigated, 157-186 degrees C, but in the course of this study a very powerful catalysis by lead oxide of the thermal decomposition of nitroalkanes was discovered and investigated in some detail.
GRA

N80-19287# Southwest Research Inst., San Antonio, Tex. Army Fuels and Lubricants Research Lab.
DIESEL ENGINE ENDURANCE TEST WITH WATER-CONTAINING FIRE-RESISTANT FUEL Interim Report, Mar. - Sep. 1977
J. V. Moffitt, E. C. Owens, B. R. Wright, and W. D. Weatherford, Jr. Sep. 1979 59 p refs
(Contracts DAAG53-76-C-0003; DAAK70-78-C-0001)
(AD-A078665; AFLRL-94) Avail: NTIS HC A04/MF A01 CSCL 21/4

A production LDT-465-1C multifuel diesel engine was operated according to a double-length Army/CRC Wheeled Vehicle Test Cycle (420 total hours) using a fire-resistant diesel fuel containing 10 vol % water. The effects of this water-in-fuel macroemulsion on engine power output, deposits, wear, and oil degradation were examined. The results indicate that this fire-resistant fuel formulation, under the conditions evaluated, does not result in abnormal deposits nor are there any major effects (adverse or favorable) on engine wear or oil degradation. However, a significant loss in horsepower output as a function of test duration did result. Post-test examinations indicated the presence of fuel-origin deposits in the injection system which were attributed to the sugar-type surfactants used in this investigation.
Author (GRA)

N80-19288# Florida State Univ., Gainesville. Dept. of Chemistry.
INVESTIGATION OF THERMOPLASTIC ELASTOMERS AS PROPELLANT BINDERS Final Report, 1 Jun. 1976 - 31 Aug. 1979
George B. Butler 29 Nov. 1979 72 p refs
(Grant DAAG29-76-G-0223)
(AD-A078691; ARO-13960.4-CX) Avail: NTIS
HC A04/MF A01 CSCL 21/9

It was the objective of the present investigation to conduct a fundamental study of the feasibility of utilizing or developing suitable thermoplastic elastomers for use in propellant technology, and considerable progress has been made toward achieving this objective. A wide variety of thermoplastic elastomers of novel structure have been synthesized, and their fundamental physical properties determined. As a result of this study, a number of carefully selected samples were submitted to personnel at Redstone Arsenal, Alabama, for evaluation as thermoplastic propellant binders. Verbal communication has strongly indicated that the present approach is a feasible one, and has made it possible to extrapolate to a set of 'necessary' properties of the material to meet the required objectives.
GRA

N80-19289# Pennsylvania State Univ., University Park. Dept. of Mechanical Engineering.
TURBULENT BOUNDARY-LAYER ANALYSIS AND EXPERIMENTAL INVESTIGATION OF EROSIVE BURNING PROBLEM OF COMPOSITE SOLID PROPELLANTS Interim Report, 1 Oct. 1977 - 30 Sep. 1978
Mohan K. Razdan and Kenneth K. Kuo Mar. 1979 196 p refs Prepared for Atlantic Research Corp., Alexandria, Va.
(Contract F49620-78-C-0016; AF Proj. 2308)
(AD-A077351; AFOSR-79-1155TR) Avail: NTIS
HC A09/MF A01 CSCL 21/9

The purpose of this study was to investigate the frequently encountered phenomenon of erosive burning of composite solid propellants in rocket motors. Both theoretical and experimental studies were undertaken. In the theoretical model, the propellant burning process was described by considering a steady, two-dimensional, chemically reacting, turbulent boundary layer over a propellant surface. The diffusion-controlled gas-phase chemical reaction was modeled on the basis of the eddy-break-up concept. The theoretical model, comprised of a set of partial differential equations, was solved numerically. In the experimental work, a flat composite-propellant slab was burned in a test chamber by the flow of hot combustion gases which formed a turbulent boundary layer over the surface of the propellant. The burning rate of the propellant was measured by a high-speed motion picture technique at various pressures and free-stream velocities. Comparison of the theoretical results with the experimental data, obtained from the present study and that obtained from existing literature, showed a close agreement.
GRA

N80-19290# SRI International Corp., Menlo Park, Calif.
DEFLAGRATION-TO-DETONATION TRANSITION IN HMS BASED PROPELLANTS Interim Report, 1 May 1978 - 30 Apr. 1979
M. Cowperthwaite, W. J. Murri, and J. T. Rosenberg Aug. 1979 24 p
(Contract F49620-77-C-0039; AF Proj. 2308)
(AD-A078845; AFOSR-79-1286TR; PYU-6069) Avail: NTIS
HC A02/MF A01 CSCL 21/9

Theoretical and experimental studies were undertaken to explain the mechanisms that establish conditions for the occurrence of the one-dimensional deflagration-to-detonation transition (DDT), and to formulate a satisfactory model for a quantitative description of this transition. The theoretical studies were concerned with the thermo-hydrodynamic treatment of DDT. The central problem is to model the propagation of the unsteady flame and the flow it produces ahead of the flame front. The compressive flows produced by an accelerating flame and by an accelerating piston were compared to provide a better physical understanding of the compressive action of an accelerating flame; conditions for shock formation in a compressive flow were formulated. The condition for shock formation in the compressed state is that the second derivative of the Lagrange pressure-specific volume compression curve be positive. When this condition is satisfied, a shock is always formed by an accelerating piston but not always by an accelerating flame. As the piston accelerates, the compression waves emanating from it overtake each other and coalesce to form a shock. But the accelerating flame can overtake and consume compressed material before the compression waves emanating from it coalesce to form a shock. In the experimental study, an assembly was designed to allow incorporation of stress gages into propellant charges during the casting process, thereby eliminating the expensive machining and grooving operations conventionally used in constructing targets for langrange gage experiment.
GRA

N80-19291# Arkansas Univ., Fayetteville. Dept. of Chemical Engineering.
EVAPORATION AND DISPERSION OF HAZARDOUS MATERIALS Final Report, 15 May 1978 - 14 May 1979
Charles Springer Jun. 1979 85 p refs
(Grant AF-AFOSR-3559-78; AF Proj. 2303)
(AD-A077399; AFOSR-79-1062TR) Avail: NTIS
HC A05/MF A01 CSCL 21/9

This work was undertaken in order to develop a state-of-the-art predictive model for the evaporation and dispersion of hazardous liquids, especially hydrozine family fuels and propellants, which might be accidently spilled. All of the several model elements have been assembled and combined in a FORTRAN computer program which will compute evaporation rates and limits of the hazardous region, that is, the maximum distance away from the centerline where a hazard would exist as well as the maximum distance down wind that a hazard would exist. Depending upon the input data supplied, the program will also predict the amount of water that would be required for sufficient dilution to eliminate the hazard, the effects of changing variables (as for example, the effects of changes in wind speed, or in air temperature or in atmospheric stability), and the effect of the passage of time (up to twenty-four hours) if weather conditions are updated hourly. In the latter case, allowances are made for composition changes in the remaining pool because of preferential evaporation of components, possible absorption of water from the

atmosphere, and absorption of (and reaction with) carbon dioxide from the atmosphere. A number of computations were made in order to determine the effects of changes in the several input parameters. Author (GRA)

N80-19292# Delaware Univ., Newark.
KINETICS AND MECHANISM OF DESULFURIZATION AND DENITROGENATION OF COAL-DERIVED LIQUIDS Quarterly Report, 21 Jun. - 20 Sep. 1978
B. C. Gates, J. R. Katzer, J. H. Olson, H. Kwart, and A. B. Stiles 16 Mar. 1979 134 p refs
(Contract EX-76-C-01-2028)
(FE-2028-15; QR-13) Avail: NTIS HC A07/MF A01

Studies of competing hydroprocessing reactions catalyzed by Ni-Mo/gamma-Al2O3 and involing quinoline, indole, dibenzothiophene, and naphthalene in n-hexadecane show that marked interactions exist. The naphthalene hydrogenation rate is reduced by the presence of quinoline; whereas the reactivity of quinoline is unchanged by the naphthalene. The rate of hydrodenitrogenation of indole, a non-basic nitrogen-containing compound is strongly reduced by the presence of quinoline, whereas the rate of hydro-denitrogenation of quinoline, a basic nitrogen-containing compound, is unaffected by the presence of indole. The hydrogenation reactions in the dibenzothiophene reaction network are inhibited severely as indicated by the reduction in their pseudo first-order-rate constants as are the hydrogenation reactions for naphthalene. Thus the hydrogenation rate is reduced 30-fold by increasing the inital quinoline concentration from 0.0 to 0.5 wt % in naphthalene hydrogenation and in dibenzothiophene hydrodesulfurization. The rate of direct sulfur removal is reduced by only 3-fold by increasing the quinoline concentration from 0.0 to 0.5 wt %. DOE

N80-19293# Lehigh Univ., Bethlehem, Pa.
CENTRIFUGAL FLUIDIZED COMBUSTION OF COAL Final Report
E. K. Levy and J. C. Chen Jan. 1979 130 p refs
(Contract EX-76-S-01-2516)
(FE-2516-9) Avail: NTIS HC A07/MF A01

Batch experiments on bed startup, minimum fluidization, and pressure drop were performed using room temperature air at atmospheric pressure. Particular attention was given to the effects of grid pressure drop, grid taper angle, mass of bed material, speed of rotation, and particle size and density on fluidization. The experiments demonstrated that it is possible to start up a centrifugal fluidized bed (CFB) from rest, that the system fluidizes in a predictable fashion, and that the minimum fluidization velocities and bed pressure drops are in good agreement with the theoretical models developed for the CFB. The experimental data indicate that it is possible to feed and remove solids continuously and achieve a stable bed thickness in a rotating fluidized bed. Experiments performed on particle elutriation show that the air flow rate at which particle loss is initiated is a strong function of the angular velocity of the bed and the bed thickness. At higher flow rates, the rate of particle loss depends on air flow rate, angular velocity, and bed thickness. DOE

N80-19294# Brookhaven National Lab., Upton, N. Y.
POTENTIAL OF BIOMASS CONVERSION IN MEETING THE ENERGY NEEDS OF THE RURAL POPULATIONS OF DEVELOPING COUNTRIES: AN OVERVIEW
V. Mubayi, J. Lee, and R. Chatterjee (State Univ. of New York, Stony Brook) 1979 18 p refs Presented at the Am. Chem. Soc. Natl. Meeting, Washington, D.C., 11-14 Sep. 1979
(Contract EY-76-C-02-0016)
(BNL-26721; CONF-790917-11) Avail: NTIS HC A02/MF A01

A preliminary assessment is presented of the contribution biomass conversion could make in the context of the rural areas of six developing countries: India, Indonesia, Peru, Sudan, Tanzania, and Thailand. The technologies selected for analysis are: anaerobic digestion of wet biomass to produce methane and pyrolysis of dry biomass to produce charcoal, liquid fuels, and low Btu gases. Preliminary estimates are made of the amounts of fuels that could be produced in each of the selected countries by a combination of these technologies. It was found that, with the exception of India, implementation of these technologies could potentially meet the future energy needs of their rural populations for both subsistence and development. DOE

N80-19295# California Univ., Livermore. Lawrence Livermore Lab.
METHANOL AS A TRANSPORTATION FUEL: ASSESSMENT OF ENVIRONMENTAL AND HEALTH RESEARCH
H. Timourian and F. Milanovich 18 Jun. 1979 97 p refs
(Contract W-7405-eng-48)
(UCRL-52697) Avail: NTIS HC A05/MF A01

The current status of knowledge on the health and environmental impacts resulting from the use of methanol and methanol-gasoline blends as automotive fuels is evaluated. The physical and technical background on methanol as an automotive fuel is reviewed, as well as the environmental, biological, and human health effects associated with the impact of methanol use and production. The main issues that must be resolved by further research programs, and recommended research to address the main issues are outlined. An extensive bibliography is included. DOE

N80-19296# Department of Energy, Bartlesville, Okla. Energy Technology Center.
PHYSICAL PROPERTIES OF GASOLINE/ALCOHOL BLENDS
F. W. Cox Sep. 1979 36 p refs
(BERC/RI-79/4) Avail: NTIS HC A01/MF A01

Exeprimental data were generated for the octane number, water tolerance, micro vapor pressure, and distillation characteristics of gasoline/alcohol blends. The alcohols studied were methanol, ethanol, n-propanol, i-butanol, and two synthetic methyl fuels, each at 5, 10, and 15 weight percent in two gasolines which had substantially different property values. Each physical property is discussed in reference to value changes brought about by gasoline differences and those brought about by alcohol differences. DOE

N80-19297# Colorado Energy Research Inst., Golden.
HYDROGEN AND METHANE SYNTHESES THROUGH RADIATION CATALYSIS Progress Report, 1 Sep. 1978 - 1 Aug. 1979
Sep. 1979 53 p refs
(Contract EG-77-C-02-4258)
Avail: NTIS HC A04/MF A01

The production of hydrogen through water radiolysis atCo-60 gamma energies, in the presence of solid oxide catalysts was studied to obtain an improved theoretical understanding of radiation-induced hydrogen generation within the framework of the electronic theory of catalysis. Correlation of hydrogen yield with catalytic activity, based on prior work, was difficult to attain and an assessment of experimental parameters was made. Three sets of observations appear of some significance, however: (1) antimony oxide (Sb2O3, Eg = 3.3) shows consistently a dramatic increase in catalytic performance which cannot be attributed solely to band gap values; (2) there appears to be a correlation between hydrogen yield and dielectric properties of the catalyst; and (3) gamma irradiation changes the constitutive electrical properties of oxide catalyst in a manner proportional to hydrogen yields. DOE

N80-19298# Carnegie-Mellon Univ., Pittsburgh, Pa.
THE CHEMISTRY OF SULFUR IN CHAR AND THE IMPLICATIONS FOR HYDROGASIFICATION/HYDRODESULFURIZATION Ph.D. Thesis
A. E. McIver Sep. 1979 289 p refs
(Contract EX-76-C-01-2449)
(FE-2449-9) Avail: NTIS HC A13/MF A01

Experimental results, which elucidate the factors which govern the equilibrium distribution of sulfur between organic sulfur in char and gaseous hydrogen sulfide, are presented. These experiments were conducted at between 1200 F and 1600 F, for values of the ratio (P/sub H2S//P/sub H2/) ranging from 1 to 100 atmospheric pressure and for several chars. The rank of the parent coals from which these chars were derived ranged from lignite to anthracite. It is shown that the partial pressure ratio (P/sub H2S//P/sub H2/) is the pressure-dependent parameter which governs the extent of char sulfidation. It is also shown that the extent of char sulfidation is not uniquely

dependent upon the char surface area, but decreases with increasing rank of the char, and the rank of the coal from which the char is derived. Char sulfidation is shown to be a reversible process. The kinetics of char desulfurization are shown to be a function of the physiochemical history of the char - i.e., char desulfurization is a path-dependent process. The analogy between the chemistries of oxygen and sulfur in char are explored, and the implications for coal sulfur management are outlined. DOE

N80-19299# Los Alamos Scientific Lab., N. Mex.
THERMOCHEMICAL PROCESSES FOR HYDROGEN PRODUCTION Progress Report, 1 Oct. 1978 - 31 Mar. 1979
Kenneth E. Cox, comp. Sep. 1979 23 p refs
(Contract W-7405-eng-36)
(LA-7937-PR) Avail: NTIS HC A02/MF A01

A 50 percent efficiency was obtained when an improved bismuth sulfate cycle design was coupled to a fusion energy source at 1500 K. The improved design was based on a reduction endothermic requirement for Bi2O3 2SO3 decomposition and a lower voltage for SO2 electrolysis that should result at lower acid concentrations. Experimental results showed an endothermic heat requirement of +172 kJ/mol for the decomposition of (Bi2O3) 2SO3 to (Bi2O3) (SO3) and SO3. Reaction times for bismuth sulfate decomposition were determined as a function of temperature. At 1240 K, < 1.5 min were required for the first two stages of decomposition from (Bi2O3) (3SO3) to (Bi2O3) (SO3). In tests made to determine the feasibility of decomposing (Bi2O3) (2SO3) in a fluidized bed, the solid particles agglomerated when heated. Solid particles suitable for fluidization will be sought through new approaches. DOE

N80-19300# Physical Sciences, Inc., Woburn, Mass.
COAL PROCESSING FUEL CELL UTILIZATION. TASK 8: H2S REMOVAL BY CALCIUM-BASED SORBENTS
Girard A. Simons and W. T. Rawlins Mar. 1979 44 p refs
(Contract EW-78-A-21-8450)
(PSI-TR-167) Avail: NTIS HC A03/MF A01

A transport model was developed to describe the diffusion limited processes in SO2 cleanup by limestone. Equilibrium calculations indicate an optimum thermodynamic limit of (H2S)/(H2O) for a typical fluidized bed gasification process using limestone or dolomite at temperatures of 1000 to 1200 K; thus the minimum H2S level which can be attained in the gasifier is probably near 100 ppM. Detailed kinetic investigations show that the kinetic rate constant for CaO with H2S is of the same magnitude as that with SO2 and that the activation energy for both reactions is less than 10 K cal/mole. The model takes into account the following: (1) the grain theory; (2) the addition of sulfur deposits; and (3) the effects of the calcination temperature and CO2 background on the pore structure. R.E.S.

N80-19301# Princeton Univ., N. J. Dept. of Mechanical and Aerospace Engineering.
SOLID PROPELLANT COMBUSTION MECHANISM RESEARCH Annual Report, 1 Apr. 1978 - 31 Mar. 1979
L. H. Caveny, W. A. Sirignano, and S. W. Cheng Apr. 1979 41 p ref Sponsored in part by Army Ballistic Res. Lab.
(Contract N00014-75-C-0705; NR Proj. 092-516)
(AD-A078831; MAE-1373) Avail: NTIS HC A03/MF A01 CSCL 21/2

This research is directed at making direct measurements of the acoustic admittance of flames and interpreting those measurements in terms of flame models. Laser Doppler velocimetry (LDV) instrumentation, pressure detectors, and data analysis techniques were set up and used successfully to measure the acoustic response of a propane/air burner system. Applications of the techniques to solid propellants are described and are the subjects of the continuing research. GRA

N80-19302# Lehigh Univ., Bethlehem, Pa. Center for Surface and Coatings Research.
METHANOL AND METHYL FUEL CATALYSTS Quarterly* Report, Jun. - Aug. 1979
Kamil Klier and Richard G. Herman Sep. 1979 10 p
(Contract ET-78-S-01-3177)
(FE-3177-4) Avail: NTIS HC A02/MF A01

It is shown that CuO/ZnO/La2O3 - 25/65/10, CuO/ZnO/CeO2 - 25/65/10, and CuO/ZnO/Al2O3 - 60/30/10 wt percent catalysts are active in the synthesis of methanol from syngas. Analogous to the binary CuO/ZnO - 30/70 catalysts, an increase in methanol yield was noted over the cerium dioxide based catalyst when the CO2 concentration in the syngas mixture was reduced from 6 percent to about 2 percent. A similar decrease in the CO2 concentration over the aluminum-based catalyst, however, resulted in a decrease in catalytic activity. Thus, the roles played by the Al2O3 and CeO2 supports are distinctly different. Over the lanthanum-based catalyst, a decrease in the CO(CO2) flow rate decreased the gas hourly space velocity and increased the H2/C ration and appeared to result in the direct reaction of CO2 with H2. DOE

N80-19303# Brigham Young Univ., Provo, Utah. Dept. of Chemical Engineering.
MIXING AND GASIFICATION OF COAL IN ENTRAINING FLOW SYSTEMS Quarterly Technical Progress Report, 1 Jan. - 31 Mar. 1979
L. Douglas Smoot and Paul O. Hedman Apr. 1979 25 p refs
(Contract EF-77-S-02-2666)
(FE-2666-T1; QTPR-8) Avail: NTIS HC A02/MF A01

Four cold-flow mixing tests were conducted to help resolve difficulties in reproducing gas mixing data. The difficulty was identified and corrected. Nine additional cold-flow mixing tests were also performed to investigate the effect of coal particles in place of silicon particles. The secondary jet swirl generator for use in the cold-flow facility was completed. The method of blanketing the coal feeder with an inert gas was modified during the period, and pressure gauges were added to the system to allow coal feeder and reactor pressures to be monitored. The feasibility of using specific ion electrodes for analysis of sulfide in the quench water was demonstrated. A two-dimensional axi-symmetric gasification model was formulated, coded, and evaluated. Comparison between prediction and measurement for both cold-flow and reacting gases were made. DOE

N80-19304# Exxon Research and Engineering Co., Bayton, Tex. Research and Development Div.
FLUID COKING OF COAL LIQUEFACTION RESIDUES: THE FOURTH RESIDUE Final Technical Progress Report
S. Zaczepinski Jan. 1979 73 p
(Contract EX-76-C-01-2422)
(FE-2422-28) Avail: NTIS HC A04/MF A01

The applicability of current fluid coking technology to processing of coal liquefaction residues was evaluated by characterizing the coal liquefaction residues and assessing the effect of major coking process variables on yields and operability. Summary statements of results obtained on residues 1, 3 and 4 are: the ash content and feed fraction boiling below 1000 F are the only major analytical differences between these three residues; the net liquid recovered expressed on an ash-free 1000 F+ feed basis shows no feed dependence and no process variable effects; and the liquids recovered in fluid coking of these residues are the 1000 F- fraction of the feed and net 1000 F+ boiling product liquid. The process will recover the feed fraction boiling below 1000 F, but the net liquid produced boils at temperatures greater than 1000 F fluid coking operability (bogging) does not appear to be a limit over the temperature range of interest. Interim results are reported on the fourth sample (H-coal vacuum still bottoms). The sample is high in ash and processing results are generally similar to the above. DOE

N80-19305# Institute of Gas Technology, Chicago, Ill.
ENVIRONMENTAL ASSESSMENT OF THE HYGAS PROCESS. VOLUME 1: HYGAS ENVIRONMENTAL CHARACTERIZATION, DATA SYNTHESIS, ANALYSIS, AND INTERPRETATION, TESTS 37 - 64 Interim Report
Robert J. Jonardi, Louis J. Anastasia, Michael J. Massey (Carnegie-Mellon Univ.), and Richard H. Karst Jun. 1979 207 p refs
(Contract EX-76-C-01-2433; Proj. 61014)
(FE-2433-25-Vol-1) Avail: NTIS HC A10/MF A01

Report data published in the form of monthly and quarterly reports covering HYGAS test 37 through 64 are analyzed. The current program state-of-the-art, is described and future tasks are outlined. The environmental data base is divided into parts one for the coal pretreatment section, and the other for the

gasification section and related downstream operations. The format employed is to identify the fate of selected coal constituents (for example, coal nitrogen, sulfur, and trace elements) along with other environmentally important species liberated or produced during the gasification process (for example, phenolic compounds). DOE

N80-19306# Hydrocarbon Research, Inc., Lawrenceville, N. J.
DEVELOPMENT OF A FAST FLUID BED GASIFIER, TASK 2 AND 3 Quarterly Progress Report, Oct. - Dec. 1978
Feb. 1979 23 p refs
(Contract EX-76-C-01-2361)
(FE-2361-40) Avail: NTIS HC A02/MF A01

A coal gasifier for low Btu gas utilizing the principle of the fast fluid bed unit operation is considered. The gasifier will be operated to determine operating parameters, feasibility and visibility of a fast fluid bed gasifier. Procurement and construction of the experimental gasifier system was finished in December. A cold test program was also satisfactorily completed. The test lasted for seven days and included instrument checks, equipment evaluation and pressure testing for leaks. DOE

N80-19307# Purdue Univ., Lafayette, Ind.
SYSTEMS STUDIES OF COAL CONVERSION PROCESSES USING A REFERENCE SIMULATOR Quarterly Report, 1 Jan. - 31 Mar. 1979
G. V. Reklaitis, M. K. Sood, Y. Soni, B. W. Overturf, W. Weide, Jr., C. R. Wilkinson, J. Boo, and P. Buchanan Jun. 1979 90 p refs
(Contract EX-76-C-01-2275)
(FE-2275-11) Avail: NTIS HC A05/MF A01

Manuals were completed for the physical properties (PPROPS), process costing (PCOST), and detailed simulation (DSP-I) packages. A final manual was issued for the steady state pyrolysis system (SS/PP) model. The process simulation package (S4) was revised and used to execute simulations of the bulk methanation and water quench pyrolysis vapor recovery process sections. Sample results from these simulations are given. The DSP-I system was used to execute design calculations for the process steam and power generation section. Work was completed on the lift-tube model. The mixed algebraic and ordinary differential equation model is quite stiff and requires the use of Gear's implicit method for successful integration. Parameter studies indicate that, for purposes of converging the gasifier-combustion section recycle flows, a simplified form of the lift-tube model will suffice. However, for design of the device, the detailed model is required. DOE

N80-19308# Grace (W. R.) and Co., Memphis, Tenn. Agricultural Chemicals Group.
SYNTHESIS GAS DEMONSTRATION PLANT PROGRAM, PHASE 1 Quarterly Technical Progress Report, 1 Jan. - 31 Mar. 1979
M. R. Simpson 1979 27 p
(Contract ET-77-C-01-2577)
(FE-257706; QTPR-06) Avail: NTIS HC A03/MF A01

All activities regarding the commercial plant design, including the various trade-off studies, are essentially complete. Evidence of this stage of activity includes the delivery to DOE of all schematics, plot plans and plot elevations for the commercial plant. Demonstration plant design progressed satisfactorily (27.2 percent as of December 31, 1978, versus 58.4 percent complete as of March 31, 1979). Two additional pilot plant runs were completed. Coal feedstock was selected so as to verify the operability of the coal gasification process on coals of varying characteristics within the Kentucky No. 9 seam. Activities continued regarding development of the Environmental Report and of the various plans for obtaining raw materials and utilizing or otherwise disposing of products and by-products. Work has initiated in the areas of the capital and operating cost estimates and the phase 2 construction plan. DOE

N80-19309# Research Triangle Inst., Research Triangle Park, N. C.
POLLUTANTS FROM SYNTHETIC FUELS PRODUCTION: SAMPLING AND ANALYSIS METHODS FOR COAL GASIFICATION Final Report, Aug. 1978 - Jul. 1979
S. K. Gangwal, P. M. Grohse, D. E. Wagoner, D. J. Minick, and C. M. Sparacino Aug. 1979 102 p refs
(Grant EPA-R-804979)
(PB80-104656; EPA-600/7-79-201) Avail: NTIS HC A06/MF A01 CSCL 07D

Methods described for sampling and analyzing particulates, organic condensibles, and vapors or gases in the raw product stream of the gasifier as well as for solid residues include: (1) gas chromatography procedures for measuring fixed gases, C1-C5 hydrocarbons, sulfur gases, and C6-C8 aromatics; (2) atomic adsorption procedures for measuring toxic trace elements include those for arsenic, selenium, lead, cadmium, chromium, and mercury; (3) using polymeric sorbents to collect volatile or organics from the gas stream for analysis by glass capillary mass spectrometry; and (4) the prefractionation of tar by solvent partitioning into acid, base, and neutral fractions. Each fraction is analyzed by capillary GC/MS or high-performance liquid chromatography (HPLC). Typical results are given to illustrate the nature of the compounds studied, the methodologies, and their sensitivities. GRA

N80-19310# Catalytic, Inc., Philadelphia, Pa.
APPLICATION OF COKE PLANT CONTROL TECHNOLOGIES TO COAL CONVERSION Final Report, Aug. 1977 - Mar. 1979
S. M. Hossain, A. B. Cherry Cilione, and W. J. Wasylenko, Jr. Aug. 1979 214 p refs Sponsored by EPA
(Contract EPA-68-02-2167)
(PB80-108954; EPA-600/7-79-184) Avail: NTIS HC A10/MF A01 CSCL 13B

Process and waste stream characteristics from the by-product coke oven process are compared with selected gasification and liquefaction processes. Recommendations are given regarding control technologies for air, water, and solid wastes. State and Federal regulations for the disposal and treatment of coke oven wastes are presented, along with a brief assessment of health effects attributed to coke oven emissions. Study results indicate that a number of coke oven control technologies are applicable to coal conversion systems. By-product upgrading and fugitive emission control technologies may be readily transferable to analogous coal conversion applications. Desulfurization and wastewater treatment technologies, however, cannot be transferred readily to applications where significant differences exist in the composition, temperature, and pressure of the two categories of process/waste streams. GRA

.31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N80-19311 Ohio State Univ., Columbus.
COOLING LIQUID He-3 BELOW 1 mK BY NUCLEAR DEMAGNETIZATION Ph.D. Thesis
Kevin Albert Muething 1979 295 p
Avail: Univ. Microfilms Order No. 8001789

The design and construction of a nuclear adiabatic demagnetization cryostat is detailed and the cooling of approximately 20 cc of liquid He-3 to a temperature of 0.4 mK is discussed. The net heat leak to the nuclear stage was only 5 nW and the run time being 1 mK was in excess of two days. The thermal resistances between the liquid He-3 and the nuclear spins of the copper bundle are examined. Extensive calculations and measurements show that the Kapitza resistance between the palladium heat exchanger and the He-3 is the dominant factor. A single mathematical approach to optimizing the cooling of the He-3 by minimizing the entropy production in the bundle is also presented. The results of this optimization can be used with a microprocessor based controller to automate the demagnetization process and to evaluate the effects of making changes in the apparatus. Dissert. Abstr.

N80-19312 British Library Lending Div., Boston Spa (England).
SEALING TECHNIQUES FOR ULTRA-HIGH VACUUM SYSTEMS
J. vanEsdonk Oct. 1979 17 p refs Transl. into ENGLISH from Lastechniek (Eindhoven), v. 44, no. 4, 1978 p 53-60

(BLL-RTS-11856) Avail: British Library Lending Div., Boston Spa, Engl.

Soldering techniques for joining metal to metal and joining metal to ceramics are described for sealing vacuum components without flux. Techniques discussed for metal to metal seals include high frequency soldering, soldering in an oven, and vacuum soldering. Techniques discussed for metal to ceramic seals include metallization and soldering, sealing by means of fusible ceramic, and thermocompressive sealing. A.W.H.

N80-19313 British Library Lending Div., Boston Spa (England).
IMPROVING THE PERFORMANCE AND ACCURACY OF EXTERNAL CYLINDRICAL GRINDING

Bencion Chackelecic Rubinovic, Vladislav Ivonovic Sivacek, Jakov Nikolajevic Troikij, and Valentin Ivanovic Kaplin Oct. 1979 22 p refs Transl. into ENGLISH from Wiss. Z. Tech. Hochsch. Karl-Marx-Stadt (East Germany), v. 19, no. 6, 1977 p 717-726

Avail: British Library Lending Div., Boston Spa, Engl.

A cylindrical grinding machine which enables both infeed and longitudinal grinding to be carried out with a single actively controlled tool is described. A gentle mechanical characteristic is used in the drive of the circular feed to achieve a natural negative feedback of the cutting forces. This reduces the cross-sectional error during external grinding and increases the accuracy of machining diametral dimensions in the centerless grinding process. K.L.

N80-19314# Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
MOISTURE MOVEMENT AND MOISTURE EQUILIBRIA IN PAVEMENT SYSTEMS Final Report, Nov. 1971 - Dec. 1978

Barry J. Dempsey Sep. 1979 115 p refs Sponsored by Illinois State Dept. of Transportation and FHA

(Proj. 1HR-604)

(PB80-120082; UILU-ENG-79-2017; ICHRP-179; FHWA/IL/UI-179) Avail: NTIS HC A06/MF A01 CSCL 13B

The data from the field test sites were analyzed and summarized. Procedures for determining and utilizing hydraulic parameters important to predicting moisture movement and moisture equilibria in soils and pavement materials were developed. By use of the field data and moisture model the influence of climate and intrinsic pavement conditions on subgrade moisture content and pavement behavior were analyzed. It is shown that parameters such as precipitation, temperature, time of year, and water table depth affected subgrade moisture content and pavement behavior. It is indicated that the moisture model provided the capability of predicting moisture content trends and the sensitivity of subgrade soils and pavement materials to various boundary conditions. GRA

N80-19315# California State Dept. of Transportation Sacramento. Office of Transportation Lab.
EVALUATION AND CALIBRATION OF ROAD METER DEVICES FOR MEASURING PAVEMENT RIDEABILITY Final Report, 1976 - 1979

B. F. Neal Jun. 1979 46 p refs Sponsored by Federal Highway Administration

(PB80-110422; TL-653171; FHWA/CA/TL-79-14; Rept-19303-653171) Avail: NTIS HC A03/MF A01 CSCL 13B

The state-of-the-art of road meter technology and some recent significant advances are discussed. A velocity sensor for measuring axle movement to determine roughness rather than the normal method of mechanically determining the movement between axle and car body is evaluted. Finally, methods of road meter calibration, and limited tests of a dynamometer type calibration device are described. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking*.

N80-19316 Worcester Polytechnic Inst., Mass.
CHANNEL MEASUREMENT FOR WIDEBAND DIGITAL COMMUNICATION OVER FADING CHANNELS Ph.D. Thesis

Kaveh Pahlavan 1979 184 p

Avail: Univ. Microfilms Order No. 8002694

Adaptive channel measurement obtained by feedback filtering, feed-forward, and probing technique is examined. A one-shot discrete matched filter (DMF) working at Nyquist rate as an upper bound for all conventional receivers is developed. Different channel measurement techniques working with DMF are compared in steady states average probability of error, transient (set up) time, and convergence problem. The decision feedback is superior to the other two in that it does not suffer from either saturation or any loss of packing density. The convergence of adaptive decision feedback channel estimation is critical and is studied by the conventional phase-plane analysis. It is shown that this technique suffers from 180 deg phase ambiguity which could be resolved by differentally encoding the input data. Dissert. Abstr.

N80-19317 British Broadcasting Corp., Kingswood (England). Research Dept.
SYNCHRONIZATION OF THE RADIO-4 (UK) TRANSMITTER CHAIN ON 200 kHz

G. H. Millard, R. D. C. Thoday, and H. M. Price Dec. 1979 24 p refs

(BBC-RD-1979/27) Avail: BBC, Kinswood Warren, Tadsworth, Surrey, Engl.

The means by which the carriers of three high power broadcast transmitters, operating at a frequency of 200 kHz, are phase locked are described. The effect on the service is examined. The phase locking system is described and its performance is assessed. The line signalling equipment and the equipment at the transmitting sites are described. A.W.H.

N80-19318 British Library Lending Div., Boston Spa (England).
ADJACENT-SIGNAL CHARACTERISTICS AND CO-CHANNEL INTERFERENCE OF A LAND MOBILE LINCOMPEX SYSTEM IN THE VHF BAND

S. Akiyama and Y. Kadokawa Nov. 1979 27 p refs Transl. into ENGLISH from Denpa Kenkyusho Kiho (Japan), v. 23, no. 123/124, 1977 p 49-61

(BLL-RTS-11914) Avail: British Library Lending Div., Boston Spa, Engl.

The application of a Lincompex (LPX), having a required frequency band width of 3 kHz, to a land mobile radio is discussed. The various characteristics of a trial manufactured SSB signal generator, the characteristics of the LPX radio equipment, and a report on the adjacent signal and cochannel interference characteristics are examined. A.W.H.

N80-19319# National Bureau of Standards, Washington, D.C. Electromagnetic Fields Div.
A STANDARD FOR RF MODULATION FACTOR

M. G. Arthur and G. R. Reeve Sep. 1979 89 p refs

(PB80-109085; FAA-RD-79-94) Avail: NTIS HC A05/MF A01 CSCL 17G

A modulation factor standard was developed to support the Instrument Landing System requirements for a measurement capability for the (ILS) and VHF omnidirectional radio range (VOR) navigation systems. The standard consisted of both a precision modulation meter and a stable amplitude-modulated signal source. Although designed primarily for ILS and VOR signals, it had general purpose capabilities within an rf range of 10 MHz to 500 MHz and an af range of 20 Hz to 20 kHz. Measurement uncertainty was less than 0.11 percent modulation below 90 percent modulation for ILS/VO tones of 90 Hz and above, and is somewhat greater at 30 Hz. R.C.T.

N80-19320*# National Aeronautics and Space Administration, Washington, D. C.
SIMULATION PROGRAM OF NONLINEARITIES APPLIED TO TELECOMMUNICATION SYSTEMS
Christian Thomas Dec. 1979 40 p Transl. into ENGLISH of "Programme de simulation de non-linearities applique aux systemes de telecommunications" Centre National d'Etudes Spatiales, Toulouse, France, Jan. 1978 39 p Translation was announced as N79-16185 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3198)
(NASA-TM-75511; CNES-NT-81) Avail: NTIS HC A03/MF A01 CSCL 17B

In any satellite communication system, the problems of distorsion created by nonlinear devices or systems must be considered. The subject of this paper is the use of the Fast Fourier Transform (F.F.T.) in the prediction of the intermodulation performance of amplifiers, mixers, filters. A nonlinear memory-less model is chosen to simulate amplitude and phase nonlinearities of the device in the simulation program written in FORTRAN 4. The experimentally observed nonlinearity parameters of a low noise 3.7-4.2 GHz amplifier are related to the gain and phase coefficients of Fourier Service Series. The measured results are compared with those calculated from the simulation in the cases where the input signal is composed of two, three carriers and noise power density. R.C.T.

N80-19321*# Astro Research Corp., Carpinteria, Calif.
THE GEOMETRY OF THE 37-TILE MICROWAVE ANTENNA SUPPORT STRUCTURE
Laurence A. Finley 5 Mar. 1980 24 p Sponsored by NASA Prepared for JPL
(Contract JPL-955543)
(NASA-CR-162847; ARC-TN-1083) Avail: NTIS HC A02/MF A01 CSCL 20N

The geometry of the support structure for a proposed parabolic shaped microwave antenna is examined. The surface of the antenna is comprised of 37 hexagonal shaped tiles, each connected to a truss module. The units are joined together to form a rigidized, faceted, concave parabolic surface. The geometry specifications are described through an explanation of the structural components which make up the antenna, a description of the coordinate system devised to identify the structure, and a presentation of the nondimensional results. A.W.H.

N80-19322*# Axiomatix, Los Angeles, Calif.
Ku-BAND RADAR THRESHOLD ANALYSIS
C. L. Weber and A. Polydoros 11 Jan. 1979 37 p refs
(Contract NAS9-15795)
(NASA-CR-160557; R8001-2) Avail: NTIS HC A03/MF A01 CSCL 17I

The statistics of the CFAR threshold for the Ku-band radar was determined. Exact analytical results were developed for both the mean and standard deviations in the designated search mode. The mean value is compared to the results of a previously reported simulation. The analytical results are more optimistic than the simulation results, for which no explanation is offered. The normalized standard deviation is shown to be very sensitive to signal-to-noise ratio and very insensitive to the noise correlation present in the range gates of the designated search mode. The substantial variation in the CFAR threshold is dominant at large values of SNR where the normalized standard deviation is greater than 0.3. Whether or not this significantly affects the resulting probability of detection is a matter which deserves additional attention. A.R.H.

N80-19323*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
OPTICAL-COMMUNICATION SYSTEMS FOR DEEP-SPACE APPLICATIONS
Victor A. Vilnrotter and Robert M. Gagliardi 15 Mar. 1980 60 p refs
(Contract NAS7-100)
(NASA-CR-162882; JPL-Pub-80-7) Avail: NTIS HC A04/MF A01 CSCL 17B

The feasibility of using optical communication systems for data telemetry from deep space vehicles to Earth based receivers is evaluated. Performance analysis shows that practical, photon counting optical systems can transmit data reliably at 30 to 40 dB high rates than existing RF systems, or can be used to extend the communication range by 15 to 20 dB. The advantages of pulse-position modulation (PPM) formats are discussed, and photon counting receiver structures designed for PPM decoding are described. The effects of background interference and weather on receiver performance are evaluated. Some consideration is given to tracking and beam pointing operations, since system performance ultimately depends on the accuracy to which these operations can be carried out. An example of a tracking and pointing system utilizing an optical uplink beacon is presented, and it is shown that microradian beam pointing is within the capabilities of state-of-the-art technology. Recommendations for future theoretical studies and component development programs are presented. R.C.T.

N80-19324# Mitre Corp., Bedford, Mass.
COMPUTERIZED MODELS FOR DESIGN AND ANALYSIS OF COMPUTER COMMUNICATIONS SYSTEMS
Carl Tropper May 1979 131 p refs
(Contract F19628-78-C-0001; Proj. 5720)
(AD-A078022; MTR-3664; ESD-TR-79-128) Avail: NTIS HC A07/MF A01 CSCL 17/2

This paper presents a comparison of several models that may be employed for the design and analysis of computer-communications networks. The comparison focuses on the algorithms used for the various facets of network design-routing algorithms, network reliability models, etc. Two models of particular interest have been singled out - one is in the area of protocol design, and the other is an overall network design program. GRA

N80-19325# Naval Postgraduate School, Monterey, Calif.
ACOUSTOOPTIC SPECTRUM ANALYSIS AND NARROWBAND INTERFERENCE EXCISION IN WIDEBAND SIGNAL ENVIRONMENTS Thesis Report, 1 Oct. 1975 - 30 Sep. 1979
F. Weldon Regan, III Sep. 1979 114 p refs
(AD-A078286; NPS62-79-011) Avail: NTIS HC A06/MF A01 CSCL 17/8

This thesis is a study of performance measures for acoustooptic spectrum analysis, and optical excision of narrowband interference. A Gaussian laser beam model is developed and programmed for propagation through thin lenses. Effects of beam truncation by Bragg cell apertures are examined. Bragg cell performance is analyzed with respect to diffraction efficiency, information capacity, and response agility. A performance comparison is made between charge-coupled device and photodiode technologies in photodetector array applications. Overall excisor performance is discussed in terms of interference removal effectiveness and process corruption of residual information bearing signals. GRA

N80-19326# Polytechnic Inst. of New York, Farmingdale. Dept. of Electrical Engineering.
CONTRIBUTATIONS TO SIGNAL PROCESSING FOR THE HALLO PROGRAM Final Technical Report, 1 Sep. 1978 - 30 Sep. 1979
A. Papoulis Nov. 1979 109 p refs
(Contract N00014-76-C-0144; ARPA Order 2684)
(AD-A078217; POLY-EE-79-05B) Avail: NTIS HC A06/MF A01 CSCL 17/9

A number of topics were investigated related to image restoration, clutter reduction, detection of moving targets, spatial and temporal filtering, and spectral estimation. These topics originated with various aspects of the HALLO program but have more general applications including underwater detection, target identification from undersampled radar returns, deconvolution, ultrasonics, detection of points and edges, detection of hidden periodicities and speech processing. GRA

N80-19327# Lincoln Lab., Mass. Inst. of Tech., Lexington.
EXPERIMENTAL MEASUREMENTS OF GROUND REFLECTION ELEVATION MULTIPATH CHARACTERISTICS AND ITS EFFECTS ON A SMALL APERTURE ELEVATION TRACKING RADAR
David F. Sun 5 Mar. 1979 156 p
(Contract F19628-78-C-0002; ARPA Order 2752)

(AD-A077915; TN-1979-21; ESD-TR-79-38) Avail: NTIS HC A08/MF A01 CSCL 17/9

Field measurements for collecting ground reflection data at L-band have been taken at several sites at the Hanscom Air Force Base and Fort Devens. These field data were used for (1) characterization of the multipath environment; (2) validation of propagation models developed for elevation multipath; (3) simulation of elevation angle estimation; and (4) evaluation of various spectral estimation methods and elevation angle estimation algorithms. 'Classical' and 'data adaptive' angular power spectral estimators have been employed as a means to characterize the multipath environment. The maximum entropy angular power spectral estimates appeared to yield better resolution of various multipath arrivals. For propagation model validation, the field measurement results and the computer simulation results have been compared in terms of the angular power spectrum for a variety of measurements made at these sites with various terrain conditions. In most cases, especially when the terrain variation was simple and could be quite accurately modeled as a series of simple rectangular ground plates, fairly good agreement between the propagation model predictions and the field measurement results was obtained in terms of the estimated elevation angles of the direct signal and the ground reflected signals, the number of the ground reflected signals and their multipath levels. GRA

N80-19328# Naval Ocean Systems Center, San Diego, Calif.
SCINTILLATION OF UHF SATCOM SIGNALS, OCURRENCE AT GUAM FROM MID-MARCH 1978 - JUNE 1979 Final Report
M. R. Paulson 15 Aug. 1979 38 p refs
(AD-A078287; NOSC/TR-328) Avail: NTIS HC A03/MF A01 CSCL 04/1

The occurrence of significant scintillation at Guam has greatly increased over that observed during the 1976 solar activity minimum. The seasonal variation in scintillation shows a broad maximum, increasing in March and decreasing in October, with little scintillation during November through February. Scintillation frequently can cause uhf satellite communications outages of 6-8 hours a night, with occasional outages of 10 hours or more. Although only seasonal variation and solar activity dependence have been shown, there may be other, unidentified factors that affect the occurrence of scintillation. GRA

N80-19329# Georgia Inst. of Tech., Atlanta. Systems and Techniques Lab.
ELECTROMAGNETIC SHIELDING OF STRUCTURAL FOAMS BY USING INTERNAL CONDUCTIVE MATERIALS Final Report, 14 Feb. 1977 - 31 Dec. 1978
D. G. Bodnar and B. M. Jenkins Aug. 1979 76 p refs
(Contract DAAG46-77-C-0027; DA Proj. 1L1-62105-AH-84)
(AD-A078718; AMMRC-TR-79-49) Avail: NTIS HC A05/MF A01 CSCL 09/1

This report summarizes the analysis performed during the program to assess the RF shielding effectiveness obtainable by using internal conductive materials in structural foams. The major emphasis was on the use of carbon/graphite fibers as the conductive material although consideration was given to metalized glass fibers and to metal particles. Several mathematical analysis techniques were considered for assessing shielding effectiveness including the method of moments, wire grid analysis, meteorological, and plane wave analysis. The plane wave analysis technique was deemed the most applicable. Calculations of shielding effectiveness are presented in the HF through UHF frequency range for various material characteristics. Test panels were fabricated and tested from 10-1,000 MHz. Carbon, graphite fibers and aluminum coated glass fibers were used as the filler material in the foam panels. Measured data are presented for different concentrations as well as for different types of filler material. Two of the materials tested provided adequate shielding for civilian radio frequency equipment application in the UHF (300-3,000 MHz) region. GRA

N80-19330# Ohio State Univ., Columbus. Electroscience Lab.
ASYMPTOTIC HIGH FREQUENCY TECHNIQUES FOR UHF AND ABOVE ANTENNAS Final Report, 1 Aug. 1976 - 31 Jul. 1979
R. C. Rudduck, R. J. Marhefka, W. D. Burnside, R. G. Kouyoumjian, and C. H. Walter Sep. 1979 88 p refs
(Contract N00123-76-C-1371)
(AD-A077651; ESL-784508-20) Avail: NTIS HC A05/MF A01 CSCL 09/1

The overall scope of the program on Contract No. N00123-76-C-1371 between The Ohio State University ElectroScience Laboratory and the Naval Ocean Systems Center is to develop the necessary theory, algorithms and computer codes for simulating antennas at UHF and above in a complex ship environment. The work consists of: (1) basic scattering code development; (2) reflector antenna code development; and (3) basic studies to support items (1) and (2). This report describes the progress in each of these areas for the period 1 August 1976 to 31 July 1979. GRA

N80-19331# Ohio State Univ., Columbus. Electroscience Lab.
POINTING ACCURACY AND DYNAMIC RANGE IN A STEERED BEAM ADAPTIVE ARRAY
R. T. Compton, Jr. Nov. 1979 34 p refs
(Contract N00019-79-C-0291)
(AD-A078750; ESL-711847-4) Avail: NTIS HC A03/MF A01 CSCL 09/3

This report examines the performance of a steered beam adaptive array as a function of the beam pointing error. The purpose is to determine how close the steered beam has to be to the actual desired signal arrival angle for good performance. It is shown that the beam pointing error that can be tolerated is essentially a question of dynamic range. The greater the desired signal dynamic range that must be accommodated by the array, the more accurate the beam pointing angle must be. GRA

N80-19332*# Naval Research Lab., Washington, D. C.
A UNIQUE RADIO OCEANOGRAPHIC RADAR Final Report
James E. Kenney (NASA, Langley Research Center) and Edward J. Walsh (NASA, Wallops Station) Nov. 1979 24 p
(Contract NASA Order L-17098-A)
(AD-A077364; NRL-MR-4086) Avail: NTIS HC A02/MF A01 CSCL 17/9

A 36 GHz computer controlled airborne radar has been developed by NRL and NASA WFC which generates a false-color coded elevation map of the sea surface below the aircraft in realtime and can routinely produce ocean directional wave spectra with off-line data processing. GRA

N80-19333# Mathematical Applications Group, Inc., Elmsford, N. Y.
THE RADOT CODE SYSTEM TO CALCULATE THE RADAR RETURN FROM A FORESTED AREA Final Report
M. O. Cohen and E. S. Troubetzkoy Oct. 1979 91 p
(Contract DAAK70-78-C-0158)
(AD-A078471; MAGI-7065; ETL-0206) Avail: NTIS HC A05/MF A01 CSCL 17/9

RADOT (Radar on Trees) is a system of FORTRAN computer codes designed to predict the radar return from a canopy of vegetation. The system combines a realistic simulation of the geometry of the trees of a forest with simple approximations as to the physics of radar scattering with individual branches and leaves. Program TREE is used to generate a prototype tree, for example, an oak tree. A tree run is based upon a detailed input description and need be performed only once for each tree type. The output is a tree model, described down to the level of individual branches and leaves, which can be combined with a 'library' of previously generated prototype trees, into a new library of prototypes. This new library subsequently serves as input to Program HIT, the main geometry code. Program FORGEN, the forest generator, combines user input with built-in distribution functions to place trees throughout a simulated forest area. The tree, itself, is one of the prototypes available from the library, scaled and reoriented by FORGEN. The output of FORGEN is a forest model which contains information as to the location, size, orientation and tree type of each tree in the forest. This forest model can be saved for all subsequent analyses involving this forest. Author (GRA)

N80-19334# Illinois Univ. at Urbana-Champaign. Electromagnetics Lab.
PROCEEDINGS OF THE ANTENNA APPLICATIONS SYMPOSIUM Final Report
Sep. 1979 523 p refs Symp. held at Urbana-Champaign, Ill., 26-28 Sep. 1979
(Contract F19628-79-M-0015)
(AD-A077167) Avail: NTIS HC A22/MF A01 CSCL 17/9

Partial contents: Low Sidelobe Reflector Antenna for Tactical Radars; Low Sidelobe Parabolic Cylinder Antenna for Surveillance Radars; Near Field Blockage of an Ultralow Sidelobe Antenna; A Millimeter-Wave Scanning Antenna for Radar Application; Sidelobe Level Control for Unequally Spaced Arrays; A Low-Inertia Commutating Feed for Circular Arrays; Computer-Aided Fault Determination for an Advanced Phased Array Antenna; Resonance Phenomena on Multiple-Yagi Arrays; Radiation from Conformal Dipole Arrays Mounted on Dielectrically-Clad Conducting Cylinders; A Microwave Power Transmission Antenna System for the Solar Power Satellite; A Variable Impedance Radio Printed Circuit Balun; Design and Theory of Circularly Polarized Microstrip Antennas; A Common Aperture S- and X-Band Feed for the Deep Space Network; Air Launch Cruise Missile Instrumentation Antennas; Sectoral Scalar Horns for Precise Beam Control; Near Field Pattern Measurement Facility; Planar Near Field Measurements for Aircraft Antenna Applications; and A Safe Test Method for Effective Radiated Power Measurement. GRA

N80-19335# Federal Electric Corp., Vandenberg AFB, Calif. Performance Analysis Dept.
RANGE VERNIER Final Report, Jun. - Aug. 1979
Russell Roy Aug. 1979 48 p refs
(Contract F04703-77-C-0111)
(AD-A077178; PA300-T-39-32; SAMTEC-TR-79-2) Avail: NTIS HC A03/MF A01 CSCL 17/9

A collection of technical information pertaining to Range Vernier implementation on Coherent Signal Processor (CSP) radars at the Western Test Range (WTR) is presented. The Range Vernier technique is quite recent, having evolved since mid 1976. Under certain operational conditions, the technique can provide radial range measurements with Root Mean Square (RMS) noise values at subwavelength levels, plus modelable systematic error components. Measurements of such quality can significantly improve WTR metric test support capabilities. The information includes descriptions of the technique, mathematical construction of range measurements, mechanization techniques and requirements, together with error models. Also, potential applications and feasibility testing are discussed. GRA

N80-19336# Environmental Research Inst. of Michigan, Ann Arbor.
SYNTHETIC APERTURE IMAGING TECHNIQUES AT SHORT WAVELENGTHS Final Report, 1 Apr. 1976 - 30 Sep. 1979
Carl C. Aleksoff Nov. 1979 6 p refs
(Grant DAAG29-76-G-0184)
(AD-A078720; ERIM-122000-14-F; ARO-13735.4-ELX) Avail: NTIS HC A02/MF A01 CSCL 17/8

A number of bistatic synthetic aperture (SA) imaging techniques applicable to short wavelength radiation have been analyzed, and near real time two-dimensional SA imaging using visible light has been demonstrated. GRA

N80-19337# Rome Air Development Center, Griffiss AFB, N.Y.
MODES OF DIELECTRIC WAVEGUIDES OF ARBITRARY CROSS-SECTIONAL SHAPE
Leonard Eyges, Peter Gianino, and P. Wintersteiner Jun. 1979 50 p refs
(AF Proj. 2306)
(AD-A077032; RADC-TR-79-197) Avail: NTIS HC A03/MF A01 CSCL 09/3

An integral representation technique is presented for determining the modal propagation properties of a homogeneous cylindrical dielectric waveguide of arbitrary cross-sectional shape and index n1 embedded in a medium of index n2. Results are given for weakly guiding fibers of various shapes. Among these are rectangles and ellipses, which makes comparisons with previous work possible. GRA

N80-19338# Rome Air Development Center, Griffiss AFB, N.Y.
TROPOSPHERIC REFRACTIVE STUDIES FOR SPADATS RADAR SITES
Larry E. Telford May 1979 69 p
(AF Proj. 4600)
(AD-A077024; RADC-TR-79-177) Avail: NTIS HC A04/MF A01 CSCL 17/9

As prediction tracking radars have evolved, the corrections for tropospheric refractive bending and range error have become more important. Current operational requirements to track targets at elevation angles near the horizon have complicated tropospheric refraction corrections. In this report the tropospheric refractive environment is examined at nine SPADATS radar sites throughout the world. Site statistics are presented and a proposed correction algorithm is presented and tested. GRA

N80-19339# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.
GROUND SYSTEMS FOR HF ANTENNAS Final Technical Reports, Dec. 1977 - Mar. 1979
W. L. Weeks and C. L. Chen Oct. 1979 44 p
(Contract F19628-78-C-0057; AF Proj. 2305)
(AD-A077691; RADC-TR-79-222) Avail: NTIS HC A03/MF A01 CSCL 09/5

Measurements on a full-scale model ground system on actual earth were found to agree at least qualitatively with results predicted in an earlier computer study. Such ground systems of suitable length may enhance the field strength of HF antennas at low angles by at least 10 percent. GRA

N80-19340# Syracuse Univ., N. Y. Dept. of Electrical and Computer Engineering.
ELECTROMAGNETIC TRANSMISSION THROUGH A FILLED SLIT OF ARBITRARY CROSS SECTION IN A CONDUCTING PLANE OF FINITE THICKNESS
David T. Auckland and Roger F. Harrington Oct. 1979 145 p refs
(Contract F30602-79-C-0011; AF Proj. 2338)
(AD-A078477; RADC-TR-79-257) Avail: NTIS HC A07/MF A01 CSCL 20/3

Electromagnetic transmission through a filled slit in a conducting plane of finite thickness is investigated when the slit cross section is an arbitrary shape. A non-modal formulation is developed whereby the original problem is broken up, via the equivalence principle, into three isolated situations. An integral equation is written for each of these situations involving equivalent electric and magnetic currents as unknowns on the closed contour defining the slit cross section. These three integral equations are solved simultaneously and it is shown that they have a unique solution at all frequencies. A modal solution is also developed for the case when the slit cross section can be viewed as a sequence of two-dimensional rectangular cavities, each coupled to the other by an aperture. Results obtained from these two solutions are compared. Some additional slits, which cannot be solved by a modal solution, are investigated by the non-modal solution. Two approximate solutions are also investigated when the slit cross section is rectangular. For small slit widths w, such that k sub ow is much less than 1, the transmitted fields can be written in terms of a slit impedance for the TE case, and a slit polarizability for the TM case. An equivalent circuit is developed for the TE case and comparison with the modal solution is made for the slit impedance and transmission coefficient. The equivalent circuit involving the aperture impedance of a flange is shown to accurately determine the transmission characteristics of the slit. GRA

N80-19341# Naval Ocean Systems Center, San Diego, Calif.
A COMPUTER PROGRAM FOR ELF/VLF PULSE PROPAGATION IN A LATERALLY HOMOGENEOUS EARTH-IONOSPHERE WAVEGUIDE Interim Report, 1 Feb. - 30 Jun. 1979
R. A. Pappert and L. R. Shockey 31 Aug. 1979 57 p refs
(AD-A076306; NOSC/TR-444) Avail: NTIS HC A04/MF A01 CSCL 20/14

This report contains a computer program designed to handle pulse propagation problems when the propagation channel is the Earth-ionospheric waveguide. The program is intended for use in the ELF/VLF bands for laterally homogeneous channels.

Mode data as a function of frequency from a waveguide program are required inputs to the present program. The mode data are interpolated using cubic splines, and the requisite integrals are treated numerically by means of the fast Fourier transform. GRA

N80-19342# Coastal Engineering Research Center, Fort Belvoir, Va.
A SYSTEM FOR USING RADAR TO RECORD WAVE DIRECTION
Michael G. Mattie and D. Lee Harris Sep. 1979 53 p refs Sponsored by Army
(AD-A076307; CERC-TR-79-1) Avail: NTIS HC A04/MF A01 CSCL 17/9

A radar system provides images of waves in the coastal zone to obtain wave direction information is described. The heart of the system is an X-band marine radar which operates at 9,375 megahertz with a 3 centimeter wavelength and a 0.05 microsecond pulse width. The records are accumulated by photographing the plan position indicator (PPI) scope. The system is designed for unattended operation and includes an automation unit that activates the radar at preset times, usually at 2 hour intervals. A sequence of one to nine photos is obtained on each of four ranges after which the system turns off until the next scheduled observation. Wave images show single and multiple long-crested wave trains permitting observation of wave refraction and shoaling. The information content in the radar images is similar to that in aerial photos. However, radar images can be collected at night, during overcast, and in light rain conditions. Radar imagery is more limited than aircraft imagery in geographical coverage and in the quality of the imagery. Good agreement was found between estimates of wave direction and length obtained with radar and those obtained with other observational techniques. Author (GRA)

N80-19343# New Jersey Inst. of Tech., Newark
RAY OPTICAL DESCRIPTION OF WAVES GUIDED BY INTEGRATED DIELECTRIC CYLINDER-CONE STRUCTURES Final Technical Report, 29 Jan. 1976 - 31 May 1979
G. M. Whitman, P. Lisman, and S. J. Maurer Oct. 1979 57 p refs Prepared in cooperation with Analytical Science Corp., Mass. and New York Inst. of Techology
(Grant DAAG29-77-G-0094)
(AD-A076344; ARO-13677.1-ELX) Avail: NTIS HC A04/MF A01 CSCL 20/3

The techniques of ray-optics, which have provided meaningful results in the study of electromagnetic and acoustic problems, are applied to the integrated dielectric cylinder-cone configuration. The method geometrical optics is presented. The eiconal and transport equations are derived. Asymptotic boundary conditions are discussed and a generalized reflection coefficient introduced. Before investigating the cylinder-cone non-separable geometry, and understanding of the ray structure in both an infinite dielectric cylinder and, separately, in an infinite dielectric cone is needed. This is accomplished in the report and, consequently, amplitude and phase information is attained. In addition, caustics are discussed. Caustics are envelopes of the ray systems and, thus, are surfaces which separate propagating and non-propagating (or complex evanescent) regions and characterize the modal ray systems in non-uniform regions. The report concludes with a discussion of the transition region between the cylinder and the cone. GRA

N80-19344# Naval Ocean Systems Center, San Diego, Calif.
STRATEGIC BLUE-GREEN OPTICAL COMMUNICATIONS PROGRAM PLAN. INVESTMENT STRATEGY TOWARD AN OPTICAL SOLUTION FOR SATELLITE-TO-SUBMARINE INFORMATION TRANSFER Technical Document, Jun. 1978 - Jun. 1979
K. J. Kelley, L. B. Stotts, G. C. Mooradian, and R. D. Anderson 16 Jul. 1979 49 p refs
(AD-A076345; NOSC/TD-269) Avail: NTIS HC A03/MF A01 CSCL 17/2

A comprehensive data base in blue-green propagation and devices developed at NOSC and elsewhere was used to evaluate the feasibility of a space-based laser strategic satellite-to-submarine communication system designed to broadcast to operationally significant ocean areas of the world. Although a major capability in submarine communication can be obtained by sequentially transmitting data at a moderate rate to small spots that span the total operational area, this capability can be realized only by the correction of major deficiencies in the curren, blue-green technology base. Dramatically better optical filters and much more efficient and powerful lasers must be developed before the technical risk of the concept is reduced to a satisfactory level. Also required are the resolution of major uncertainties in the transmission of optical energy through clouds and a reduction in the uncertainties associated with present oceanic and cloud climatology data bases. The overall objective of the program is to determine the practicality and suitability of an optical solution for transmitting strategic information to submerged submarines. This document describes the current program plan. It outlines the various system approaches being pursued, the technical uncertainty areas in both channel characterization and subsystem technology, and the investment strategy to be followed to meet the objective. GRA

N80-19345# Advisory Group for Aerospace Research and Development, Paris (France).
TERRAIN PROFILES AND CONTOURS IN ELECTROMAGNETIC WAVE PROPAGATION
Albert W. Biggs, ed. (Kansas Univ., Lawrence) Dec. 1979 378 p refs Presented at the Specialist Meeting of the Electromagnetic Wave Propagation Panel, Spatind, Norway, 10-14 Sep. 1979
(AGARD-CP-269; ISBN-92-835-1345-2) Avail: NTIS HC A17/MF A01

The propagation problems which are connected with terrain profiles and contours were addressed. Specifically examined were theoretical aspects, methods of digital terrain mapping, and terrain effects on antenna characteristics. For individual titles, see N80-19346 through N80-19371.

N80-19346# Middle East Technical Univ., Ankara (Turkey). Electrical Engineering Dept.
THE EFFECTS OF STRATIFIED GROUND ON CHARACTERISTICS OF THE INVERTED L ANTENNA
Edip Niver (Polytechnic Inst. of N.Y., Brooklyn) and Altunkan Hizal *In* AGARD Terrain Profiles and Contours in Electromagnetic Wave Propagation Dec. 1979 13 p refs (For primary document see N80-19345 10-32)
Avail: NTIS HC A17/MF A01

Characteristics of an inverted L antenna over a homogeneous moist ground, a poor ground, and a two layered ground consisting of a frozen layer of earth above a moist earth are studied numerically using an integral equation formulation. The feed of the antenna is elevated from the base of the antenna to avoid the discontinuity in the current at the feed and to increase the accuracy of the reflection coefficient approximation used in the formulation. The current distributions are calculated by solving a Hallen's type integral equation. The input admittance and radiation patterns are calculated as a function of the length of the horizontal section. The results show that the inverted L antenna studied possesses useful impedance and radiation characteristics. Author

N80-19347# Communications Research Centre, Ottawa (Ontario).
THE EFFECTS OF RE-RADIATION FROM HIGH-RISE BUILDINGS AND TRANSMISSION LINES UPON THE RADIATION PATTERN OF MF BROADCASTING ANTENNA ARRAYS
John S. Belrose, W. Lavrench (Nat. Res. Council, Ottawa), J. G. Dunn (Nat. Res. Council, Ottawa), C. W. Trueman (Concordia Univ., Montreal), and S. J. Kubina (Concordia Univ., Montreal) *In* AGARD Terrain Profiles and Contours in Electromagnetic Wave Propagation Dec. 1979 11 p refs (For primary document see N80-19345 10-32)
Avail: NTIS HC A17/MF A01

Results of experimental measurements employing antenna modeling techniques on the re-radiation from model high rise buildings and power lines, are presented. It is found that high rise buildings are resonant in the middle of the MF broadcast band and that buildings located ten or more wavelengths (3 kilometers) from the MF broadcasting array could affect the far field pattern. It is shown that high voltage power transmission line towers, the connecting sky wires, and their image in the ground form loops which are resonant within the braodcast band.

A long power line is a system of over coupled, staggered tuned loops, and if the resonant frequency of the power line is that of a nearby broadcast station, the effects of re-radiation on the pattern of the MF broadcast antenna is large. Numerical modeling by the method of moments is in agreement with experiment although it is difficult to calculate the re-radiation from extended structures like power lines. The experimental and numerical modeling represent worst case situations, since the 'earth' is perfectly conducting and the structures employed are either insulated from or connected to it. J.M.S.

N80-19348# Mitre Corp., Bedford, Mass.
SURFACE FIELDS AND RADIATION PATTERNS OF A VERTICAL ELECTRIC DIPOLE OVER A RADIALLY VARYING GROUND SYSTEM
C. Teng and R. J. King (Wisconsin Univ., Madison) *In* AGARD Terrain Profiles and Contours in Electromagnetic Wave Propagation Dec. 1979 p 4-1 - 4-19 refs (For primary document see N80-19345 10-32)
(Grant NSF ENG-75-16174)
Avail: NTIS HC A17/MF A01

The EM propagation over and radiation from radially varying ground systems are studied by numerical methods using the compensation theorem integral formulation. The source is taken to be a vertical electric dipole (VED) situated either on or above an azimuthally symmetric plane ground system having an assumed surface impedance profile which can vary arbitrarily in the radial direction. Particular attention is given to conventional HF radial wire systems laid on both well and poorly conducting earth, and to HF ground systems near a sloping beach. For one section, radial wire ground systems, the radiation patterns are found to be independent of increasing radial length if the magnitude of the composite surface impedance is within 90% of the surface impedance of the underlying ground. It is also found that the radially varying feature tends to suppress high-angle lobes which are otherwise present with highly conducting ground systems, especially if the surrounding ground is poorly conducting. Suitable combinations of VED height, and the length and number of radials tend to enhance the low angle radiation, as does the use of compound radial wire systems. A land-sea beach on which the water depth gradually increases is shown to have little effect on the radiation pattern compared to that for an abrupt coastline. J.M.S.

N80-19349# Saarland Univ., Saarbrucken (West Germany).
TERRAIN EFFECTS ON LOG-PERIODIC ANTENNA CHARACTERISTICS USING THE SINGULARITY EXPANSION METHOD
K. D. Rech and K. J. Langenberg *In* AGARD Terrain Profiles and Contours in Electromagnetic Wave Propagation Dec. 1979 20 p refs (For primary document see N80-19345 10-32)
Avail: NTIS HC A17/MF A01

A vertical log-periodic directional antenna (LPDA) is investigated with singularity expansion method in free space, over a lossy ground and over a perfectly conducting halfspace using Nortons approximation for the Sommerfeld integrals. The influence of the feedingnetwork and of the mutual coupling of the elements as well as the influence of antenna thickness on the natural resonances is studied. The modes of the LPDA are presented and the current in frequency and time domain is computed in free space. Dependent on the ground parameters and the antenna height the pole migration in the complex frequency plane is shown and the appropriate modes are determined. Starting from the free space current distribution the transient fields of the vertical LPDA over ground are computed for various ground parameters and antenna heights. J.M.S.

N80-19350# Institute for Telecommunication Sciences, Boulder, Colo.
THEORIES OF GROUND WAVE PROPAGATION OVER MIXED PATHS
R. H. Ott *In* AGARD Terrain Profiles and Contours in Electromagnetic Wave Propagation Dec. 1979 9 p refs (For primary document see N80-19345 10-32)
Avail: NTIS HC A17/MF A01

A review is given of some common techniques for predicting the field of a dipole transmitter over an irregular, inhomogeneous terrain profile. The effects of the atmosphere are not included except to modify the degree of 'earth bulging' by the appropriate earth's radius. Some of the topics included are: (1) the impedance boundary condition, (2) the integral equation and mode-match methods for field strength predictions, for a simple knife-edge obstacle on a spherical earth, (3) the double-knife-edge diffraction formula for field strength predictions, and (4) the fields of dipoles in layered media for calculating the transmission through forest-covered and vegetated media. Author

N80-19351# Polytechnic Inst. of New York, Farmingdale. Dept. of Electrical Engineering.
HIGH-FREQUENCY SIGNAL PROPAGATION AND SCATTERING IN GUIDING CHANNELS
L. B. Felsen *In* AGARD Terrain Profiles and Contours in Electromagnetic Wave Propagation Dec. 1979 7 p refs (For primary document see N80-19345 10-32)
Avail: NTIS HC A17/MF A01

The Earth's environment contains propagation channels wherein waves can be guided because of the presence of transverse boundaries or transverse refractive index gradients. By a new approach, high frequency guiding by a single concave surface or by the boundary of an inhomogeneous surface duct is analyzed in terms of a judiciously chosen combination of rays and modes. In essence, the modes account for the cumulative effect of those rays that have experienced a great many reflections on the boundary. This hybrid formulation is appealing in that it requires far fewer rays and far fewer modes than if the field representation involves rays only or modes only, as has been customary. By an extension of the theory, it is shown that the hybrid method can also be applied to channels wherein guiding occurs between multiple transverse boundaries. Here, modes near cutoff can represent efficiently all those rays that have made many excursions between the channel walls. As an illustration, results are presented for a parallel plane waveguide excited by a line source. J.M.S.

N80-19352# Institute for Telecommunication Sciences, Boulder, Colo.
GROUND WAVE PROPAGATION OVER IRREGULAR, INHOMOGENEOUS TERRAIN: COMPARISONS OF CALCULATIONS AND MEASUREMENTS AT FREQUENCIES FROM 121 kHz TO 50 MHz
R. H. Ott *In* AGARD Terrain Profiles and Contours in Electromagnetic Wave Propagation Dec. 1979 10 p refs (For primary document see N80-19345 10-32)
Avail: NTIS HC A17/MF A01

A method for calculating the ground wave field over irregular, inhomogeneous terrain was developed and comparisons with alternative analytical methods were made for idealized terrain profiles like concave parabolas, sea-land-sea paths, and single Gaussian ridges. The computer algorithm implementing an integral equation (called PROGRAM WAGNER) uses linear interpolation to represent the terrain height versus distance and a surface impedance which also varies with distance. The transmitting antenna height is arbitrary and is included in the integral equation formulation whereas the height of the receiving antenna is treated approximately by modifying the surface field at the observation point by an effective height-gain function. Comparisons of observed field strength measurements for several paths with field strength predictions based on PROGRAM WAGNER are given for frequencies ranging from 20 kHz to 50 MHz. Although most of the comparisons show encouraging agreement, the 20 mHz comparisons over an extremely rugged path in the Colorado Mountains provided a challenge for the algorithm. J.M.S.

N80-19353# Technical Univ. of Denmark, Lyngby. Electromagnetics Inst.
AN EXPERIMENTAL STUDY OF SURFACE WAVE PROPAGATION ON A LOW PERMITTIVITY MEDIUM
J. Appel-Hansen and R. J. King *In* AGARD Terrain Profiles and Contours in Electromagnetic Wave Propagation Dec. 1979 4 p refs Prepared in cooperation with Wisconsin Univ., Madison (For primary document see N80-19345 10-32)
Avail: NTIS HC A17/MF A01

It is experimentally shown that a surface wave having d to the minus 2 power dependence can propagate on a medium having a dielectric constant near unity, when excited by a low-gain

source near the interface. This occurs for both parallel and perpendicular polarization. Author

N80-19354# Norsk Marconi A.S., Oslo.
MULTIPATH ANALYSIS OF ILS GLIDE PATH
T. Breien *In* AGARD Terrain Profiles and Contours in Electromagnetic Wave Propagation Dec. 1979 10 p refs (For primary document see N80-19345 10-32)
Avail: NTIS HC A17/MF A01

A major problem with instrument landing system slide path is the dependence of the signal quality upon site conditions. Unwanted scattering from the surroundings causes error in the guidance signal. A new method to analyze the problem is described. For practical use, the surroundings are modeled as a set of plane wedges. The scattering from each wedge is analyzed using uniform theory of diffraction (UTD), which assumes smooth, sharp and perfectly conducting wedges. Theoretical and practical work was carried out to study the influence of finite conductivity, surface roughness and round edges on the scattered signal. The conclusion is that for most glide path surroundings, UTD gives adequate accuracy. An effective UTD computer program for analysis of glide path performance was developed. Comparisons between computed and measured results show good agreement. R.E.S.

N80-19355# Air Force Avionics Lab., Wright-Patterson AFB, Ohio.
AIRBORNE MEASUREMENTS OF ELECTROMAGNETIC WAVE REFLECTIONS FROM LAND AND SEA WATER
Allen L. Johnson *In* AGARD Terrain Profiles and Contours in Electromagnetic Wave Propagation Dec. 1979 17 p refs (For primary document see N80-19345 10-32)
Avail: NTIS HC A17/MF A01

Multipath fading caused by terrain reflections can disrupt an airborne communication or navigation system. The severity of the multipath is dependent upon the antenna illumination factor, Surface reflection coefficient, and the divergence of the reflected signal. Airborne measurements were used to verify that severe multipath is regularly encountered over water when the aircraft is communicating with a satellite at a low elevation angle. Techniques which can reduce the multipath fading effect include the use of directive antennas, circular polarization and diversity techniques. R.E.S.

N80-19356# Nebraska Univ. - Lincoln. Electrical Engineering Dept.
SCATTERED RADIATION FIELDS FROM ROUGH SURFACES FULL WAVE SOLUTIONS
Ezekiel Bahar *In* AGARD Terrain Profiles and Contours in Electromagnetic Wave Propagation Dec. 1979 12 p refs (For primary document see N80-19345 10-32)
Avail: NTIS HC A17/MF A01

Full wave solutions are derived for the scattered radiation fields from rough surfaces with arbitrary slope and electromagnetic parameters. These solutions bridge the wide gap that exists between the perturbational solutions for rough surfaces with small slopes and the quasi optics solutions. Thus, it is shown for example, that for good conducting boundaries the backscattered fields which are dependent on the polarization of the incident and scattered fields at low frequencies, become independent of polarization at optical frequencies. These solutions are consistent with reciprocity, energy conservation and duality relations in electromagnetic theory. Since the full wave solutions account for upward and downward scattering, shadowing and multiple scatter is considered. Applications to periodic structures and random rough surfaces are also presented. Author

N80-19357# Saarland Univ., Saarbrucken (West Germany).
THEORETICAL ASPECTS OF TRANSIENT RADIATION AND SCATTERING IN LOSSLESS TWO MEDIUM HALF SPACES
M. Doebrich and K. J. Langenberg *In* AGARD Terrain Profiles and Contours in Electromagnetic Wave Propagation Dec. 1979 14 p refs (For primary document see N80-19345 10-32)
Avail: NTIS HC A17/MF A01

A vertical transient multipole is situated at the height Xi above a plane boundary separating two dielectric loss-less halfspaces. The potential of the primary and reflected field was evaluated by means of Fourier and Laplace transforms; their inversion was performed on the base of Cagniard's method. The relation between the Fourier integral representation and the generalized Sommerfeld integrals for multipoles is shown. R.E.S.

N80-19358# Deutsche Bundespost, Darmstadt (West Germany).
THEORETICAL DISTRIBUTION FUNCTIONS OF MULTIPATH PROPAGATION AND THEIR PARAMETERS FOR MOBILE RADIO COMMUNICATION IN QUASI-SMOOTH TERRAIN
R. W. Lorenz *In* AGARD Terrain Profiles and Contours in Electromagnetic Wave Propagation Dec. 1979 16 p refs (For primary document see N80-19345 10-32)
Avail: NTIS HC A17/MF A01

Due to the superposition of many partial waves arriving from different directions, the field strength received by a mobile antenna is an intensely fluctuating function of space. For the planning of radio service areas, the statistical distribution of the amplitudes should be known to improve frequency efficiency. Three statistical distributions were considered: the Weibull distribution, the Nakagami-m-distribution and the mixture of Rayleigh and log-normal distributions. Formulas are given for the determination of the distribution parameters from measurements. For the choice of the best distribution, three different methods are discussed. Results from measurements in quasi-smooth terrain in the 450-mHz-range are presented. R.E.S.

N80-19359# Deutsche Welle, Cologne (West Germany).
ON THE INFLUENCE OF SURFACE STATISTICS, GROUND MOISTURE CONTENT AND WAVE POLARIZATION ON THE SCATTERING OF IRREGULAR TERRAIN AND ON SIGNAL POWER SPECTRA
K. J. Hortenbach *In* AGARD Terrain Profiles and Contours in Electromagnetic Wave Propagation Dec. 1979 23 p refs (For primary document see N80-19345 10-32)
Avail: NTIS A17/MF A01

The scattering properties of different types of terrain were investigated making visible the shape and fine structure of the effective scattering area by plotting contours of constant average scattered power density on the main scattering plane. Computations and comparisons were carried out for Gaussian and actual roughness statistics, different polarizations, and moisture content of the ground. It is shown that the effective scattering area exhibits a detailed fine structure which is most complex when the angle of the incident radiation is near the pseudo-Brewster angle. This structure modifies the radiation patterns of antennas operating above irregular terrain as well as the signal characteristics. The power density spectrum of a signal transmitted or received by an aircraft flying over irregular terrain generally becomes spread due to the scattering process. The shape of the resulting spectrum depends on the orientation of the velocity vector of the aircraft relative to the scattering area and on its structure. It is also shown that the shape of the resulting spectrum has a fine structure and can be highly asymmetrical relative to the frequency of the directly incident wave which is verified experimentally. R.E.S.

N80-19360*# Massachusetts Inst. of Tech., Cambridge.
THEORETICAL MODELLING AND EXPERIMENTAL DATA MATCHING FOR ACTIVE AND PASSIVE MICROWAVE REMOTE SENSING OF EARTH TERRAIN
J. A. Kong, L. Tsang, M. Zuniga, R. Shin, J. C. Shiue, and A. T. C. Chang *In* AGARD Terrain Profiles and Contours in Electromagnetic Wave Propagation Dec. 1979 8 p refs Prepared in cooperation with NASA Goddard Space Flight Center Greenbelt, Md. (For primary document see N80-19345 10-32)
Avail: NTIS HC A17/MF A01 CSCL 20N

Two theoretical models were developed to characterize terrain media: a random medium with a variance, a horizontal correlation length; and a homogeneous dielectric containing discrete scatterers. The earth terrain is modelled as layers of such scattering media bounded by air above and half-space below. Matching the theoretical results with experimental data collected from vegetation and snow-ice fields shows that: (1) for observation angles near nadir, rough surface effects are important; (2) for snow-ice field the horizontal correlation length is greater than the vertical correlation length whereas for vegetation field their relative sizes depend on the types of vegetation; (3) the

vertically polarized backscattering cross-section is always larger than the horizontally polarized backscattering cross-section for half-space scattering media; (4) for snow field displaying diurnal change, a three-layer model including a thin top layer caused by sunlight illumination must be used; and (5) for a random medium with equal horizontal and vertical correlation lengths, the measured data can also be matched with a corresponding discrete scatterer model. K.L.

N80-19361# British Aerospace Dynamics Group, Bristol (England).
SOME OF THE PROBLEMS IN DIGITAL TERRAIN MODEL CONSTRUCTION
G. B. Thersby *In* AGARD Terrain Profiles and Contours in Electromagnetic Wave Propagation Dec. 1979 9 p (For primary document see N80-19345 10-32)
Avail: NTIS HC A17/MF A01

Aspects of terrain which may effect electromagnetic wave propagation are identified. Arguments for and against accurate terrain modelling are presented from the point of view of both the user and the software designer. Two possible approaches to digital terrain modelling are outlined as examples and the problems associated with each are discussed. The problems associated with producing a data base which is efficient in terms of computer storage and access times and which comprehensively models the terrain and associated data necessary for advanced propagation prediction modelling techniques are discussed. K.L.

N80-19362# Missouri Univ. -Rolla. Electrical Engineering Dept.
AZIMUTH BEAMWIDTH EFFECT ON RADAR SENSED TERRAIN HORIZON PROFILES
Gordon E. Carlson and Paul W. Sapp *In* AGARD Terrain Profiles and Contours in Electromagnetic Wave Propagation Dec. 1979 13 p refs (For primary document see N80-19345 10-32)
Avail: NTIS HC A17/MF A01

A method is presented for smoothed horizon generation. The mathematical model used computes elevation angle measurements for a phase-monopulse radar by considering a number of individual scattering points within the antenna beamwidth at the horizon range. Simplification of the mathematical model permits rapid generation and thus reasonable computer costs. Example smoothed horizons are shown and errors due to mathematical model simplification are analyzed. The smoothed horizon generation method is applied to the simulation analysis of a horizon checkpointing system. Results indicate that good position identification can be achieved with relatively wide azimuth beamwidths. K.L.

N80-19363# German Military Geophysical Office, Traben-Trarbach (West Germany).
BIOLOGICAL AND GEOPHYSICAL FACTORS OF ELECTROMAGNETIC WAVE PROPAGATION AND THEIR USE IN DIGITAL DATA BANKS
Ekkehard R. Kuesters *In* AGARD Terrain Profiles and Contours in Electromagnetic Wave Propagation Dec. 1979 8 p refs (For primary document see N80-19345 10-32)
Avail: NTIS HC A17/MF A01

The development of a radar clutter data bank containing data about elevation and soil cover for the whole Federal Republic of Germany is discussed. The different categories of soil cover are to be correlated with their specific effects on the propagation of electromagnetic waves. The greatest problems in this respect arise with deciduous forest and farmland because of the phenological changes that take place during the year. A phenological observation net was established to obtain data. Since it was impossible to ascertain data for each grid field, a coarse subdivision of the Federal Republic of Germany was made into regions that are homogeneous with respect to the phenological events. Because of the influence of hydrometeors on electromagnatic wave propagation, the data bank also contains data about the altitude, vertical extension, frequency of occurrence, and drop spectra of the major cloud types. K.L.

N80-19364# Lincoln Lab., Mass. Inst. of Tech., Lexington.
PREDICTION OF RADAR COVERAGE AGAINST VERY LOW ALTITUDE AIRCRAFT
John R. Delaney and M. Littleton Meeks *In* AGARD Terrain Profiles and Contours in Electromagnetic Wave Propagation Dec. 1979 15 p refs (For primary document see N80-19345 10-32)
Avail: NTIS HC A17/MF A01

A model was developed for the effects of propagation on radar coverage accounting for refraction, diffraction, and reflection. The model was applied to digitized terrain data for three sites, one with relatively hilly terrain, one with relatively smooth terrain, and one with mixed terrain. Results show that approximating the radar coverage by the potential target locations within line of sight can be quite misleading. Results also show that the coverage of lower frequency radars can be better than that of higher frequency radars in terrain where diffraction is the dominant phenomena. Moreover, the coverage of lower frequency radars in reflection-dominated terrain can be quite satisfactory if sufficient power is transmitted. The results of a field experiment confirm that the model correctly combines the effects of diffraction and reflection. K.L.

N80-19365# Joint Radio Committee of the Nationalised Power Industries, London (England).
RADIO NETWORK AND RADIO LINK SURVEYS DERIVED BY COMPUTER FROM A TERRAIN DATA BASE
C. E. Dadson *In* AGARD Terrain and Contours in Electromagnetic Wave Propagation Dec. 1979 17 p refs (For primary document see N80-19345 10-32)
Avail: NTIS HC A17/MF A01

A method of deriving calculations for the coverage area of mobile radio networks using a computer and a topographical data base is described. The topographical data base was manually produced from providing 800,000 height reference points at 0.5 kilometer intervals for England, Wales, and Scotland excluding Highlands and Islands. Path profiles are produced by the computer and calculations are provided for each 0.5 km point over the survey area, which can be up to a maximum of 90 km square. The computer requires the user to input details of the base station transmitter location, antenna height, radiated power, and type of antenna. K.L.

N80-19366# Communications Research Centre, Ottawa (Ontario).
VHF/UHF PATH-LOSS CALCULATIONS USING TERRAIN PROFILES DEDUCED FROM A DIGITAL TOPOGRAPHIC DATA BASE
F. H. Palmer *In* AGARD Terrain Profiles and Contours in Electromagnetic Wave Propagation Dec. 1979 11 p refs (For primary document see N80-19345 10-32)
Avail: NTIS HC A17/MF A01

A digital topograhic data base comprising some 150,000 sq. km of southern Ontario was established to allow terrain profiles profiles to be constructed automtically. The profiles, together with a variety of terrain surface cover information also derived from the data base, are used in the calculation of path loss, signal strength, and signal to noise ratios for various types of VHF/UHF systems. These calculations incorporate a number of additional factors necessary to achieve good agreement between predicted and measured path losses, including the effects of various types of terrain surface cover and of multiple, nonisolated obstacles. Comparisons of predictions and measurements made over a wide variety of terrain types indicate that rms prediction errors of 4 to 5 bd can be achieved in the VHF/UHF bands. K.L.

N80-19367# Genoa Univ. (Italy).
ELECTRIC FIELD COMPONENTS IN PRESENCE OF A SEA-SEA BOTTOM INTERFACE AT ELF
Giorgio Tacconi *In* AGARD Terrain Profiles and Contours in Electromagnetic Wave Propagation Dec. 1979 7 p refs Sponsored in part by the Italian National Research Council, Genoa (For primary document see N80-19345 10-32)
Avail: NTIS HC A17/MF A01

A conceptual theoretical recall as well as a collection of computed curves of the electric field rho component E sub phi, and relative phase versus distance, for a selection of bottom depths and frequencies, in the sea are presented. Such theoretical exercise is validated by some experimental results also presented in this paper. R.C.T.

N80-19368# Technical Univ. of Denmark, Lyngby. Electromagnetics Inst.

RADAR ALTIMETER MEASUREMENTS

Flemming Thomsen *In* AGARD Terrain Profiles and Contours in Electromagnetic Wave Propagation Dec. 1979 11 p refs (For primary document see N80-19345 10-32)

Avail: NTIS HC A17/MF A01

A theoretical method for calculating the output signal of a satellite radar altimeter as a function of time was developed for ice and snow covered areas. Satellite altimeters were applied by the Skylab S-193, the GEOS 3 and the SEASAT experiments. Pulse limited altimeters with pulse lengths between 10 and 100 nanoseconds were reviewed. The transmitted pulse was assumed to be rectangular. When the skin depth of the radiation was great, compared to the spatial width of the transmitted pulse, the subsurface material gave considerable contributions to the total echo. Considering altimeter measurements of snow and fresh water ice surfaces, we find skin depths ranging from 10 to several hundred meters. R.C.T.

N80-19369*# National Aeronautics and Space Administration, Washington, D. C.

A LASER PROFILOMETER FOR DIGITAL TERRAIN MAPPING

Bernard Rubin and Michael W. Fitzmaurice *In* AGARD Terrain Profiles and Contours in Electromagnetic Wave Propagation Dec. 1979 11 p refs (For primary document see N80-19345 10-32)

Avail: NTIS HC A17/MF A01 CSCL 20N

A preliminary design of a space-based decimeter accuracy ranging instrument is described along with the ranging subsystem, the pointing subsystem, and attitude reference. The measurement capabilities including ranging accuracy, the signal-to-noise ratio for water, ice, and solid Earth, footprint size, and atmospheric effects are defined and the overall system with its advantages and disadvantages are summarized. R.C.T.

N80-19370# Standard Elektrik Lorenz A.G., Pforzheim (West Germany).

AN EXPERIMENTAL INVESTIGATION OF MULTI-PATH SCATTERING AT L-BAND

P. Lewis *In* AGARD Terrain Profiles and Contours in Electromagnetic Wave Propagation Dec. 1979 24 p refs (For primary document see N80-19345 10-32)

Avail: NTIS HC A17/MF A01

The scattering effect responsible for large errors in the azimuth bearing measurements obtained with a 1 GHz monopluse receiver on a particular site when the source occupied different positions near the top of a distant hill was investigated. The received field distribution on a horizontal line of length 32 m directly in front of the monopulse antenna was sampled by a travelling probe antenna and recorded holographically. Computer processing of the hologram realised essentially a series of filtering operations to reconstruct sections of the field distribution (assuming 2 dimensional propagation in empty space) at different distances in front of the receiver, which were printed out as amplitude and phase plots. These images revealed the scattering mechanism, which included a ground reflected wave diffracted between two buildings. The reflection coefficient was in reasonable agreement with theoretical predicitons. A computer model of the scattering mechanism served both to confirm the interpretation of the experimental data and to investigate the effects of different components of the multi path field on the monopulse receiver. Maximum bearing errors to the order of 0.2 beamwidths were found. R.C.T.

N80-19371# Deutsche Bundespost, Darmstadt (West Germany).

DIFFRACTION PHENOMENA DURING MULTIPATH FADING

H. G. Gilol *In* AGARD Terrain Profiles and Contours in Electromagnetic Wave Propagation Dec. 1979 14 p refs (For primary document see N80-19345 10-32)

Avail: NTIS HC A17/MF A01

The measured electrical field strength height profiles at a receiving station located near a forest were verified. The experiments were performed on A 40-km link which operated at 9 GHz was investigated. The receiving aerial was set up on an elevator which moved up and down a 40-m tower. Electrical field strength height profiles were recorded with fade depths up to 26 dB. R.C.T.

N80-19372# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).

SPECIAL TOPICS IN HF PROPAGATION

Vincent J. Coyne, ed. (RADC, Griffiss AFB, N.Y.) Nov. 1979 585 p refs In ENGLISH and FRENCH Symp. held in Lisbon, 28 May - 1 Jun. 1979

(AGARD-CP-283; ISBN-92-835-0253-1) Avail: NTIS HC A25/MF A01

The state-of-knowledge of HF propagation as it applies to communuication, surveillance, and other systems contemplated or presently in use is presented in 49 papers. Topics cover operational considerations, modeling of ionospheric parameters, high latitude ionospheric effects, propagation through irregularities, remote sensing and ocean surveillance tunnel transmission and surface waves, and equipment considerations. For individual titles, see N80-19373 through N80-19419.

N80-19373# Royal Aircraft Establishment, Farnborough (England).

THE ROLE OF HF IN AIR-GROUND COMMUNICATIONS: AN OVERVIEW

B. Burgess *In* AGARD Spec. Topics in HF Propagation Nov. 1979 6 p refs (For primary document see N80-19372 10-32)

Avail: NTIS HC A25/MF A01

High frequency radio is a prime means for beyond line-of-eight air-ground communications and will remain as such into the foreseeable future, complementing Satellite communications where this latter system is employed. Various aspects that make up an HF communciations system and the contribution that they make to the overall system performance are reviewed. The needs of the modern user in the use of HF communications are considered with emphasis on the changing requirements on the HF link that the use of digital communications brings. Error rate performance, avoidance of interference, HF prediction techniques for Northern latitudes, and the role of channel evaluation techniques are addressed in order to acquaint the research worker with the status and trends in airborne HF communications and to indicate where further work may profitably be undertaken to eventually improve system performance. A.R.H.

N80-19374# Royal Aircraft Establishment, Farnborough (England). Radio and Navigation Dept.

HF COMMUNICATION TO SMALL LOW FLYING AIRCRAFT

N. M. Maslin *In* AGARD Spec. Topics in HF Propagation Nov. 1979 13 p refs (For primary document see N80-19372 10-32)

Avail: NTIS HC A25/MF A01

HF (2-30 mHz) radio communication is a principal means of beyond line of sight communication to aircraft. There are particularly serious problems for the small aircraft. Many factors degrade the overall received signal-to-noise ratio both at the ground and in the aircraft. To achieve satisfactory results, careful consideration should be given not only to the terminal radio equipment but also to the long term geographic planning and to the management of the frequencies to be used over mobile HF links. The worst HF communication problems occur for a short range air-ground sky-wave link at night which requires frequencies at the low end of the HF band. Working over a longer range link increasing the 'optimum working frequency', thus avoiding the poor antenna efficiencies and generally reducing external noise levels. It is shown that good frequency management, ground antenna directivity and the use of a number of geographically separated remote receiving stations are vital in providing satisfactory communications reliability to the small aircraft.

Author

N80-19375# Army Avionics Research and Development Activity, Fort Monmouth, N. J. Communication and Sensor Div.

MODERN HF COMMUNICATIONS FOR LOW FLYING AIRCRAFT

John F. Bruna and Bernard V. Ricciardi *In* AGARD Spec. Topics in HF Propagation Nov. 1979 15 p refs (For primary document see N80-19372 10-32)

Avail: NTIS HC A25/MF A01

An application of the HF propagation phenomenon that can provide relatively short range, reliable, terrain independent communications is described. It has been shown that communications out to ranges of 50 km, under varying terrain conditions, to and from low flying aircraft, is an extremely difficult problem especially for air mobile tactical forces. The US Army under the Nap-of-the-Earth Communications (NOE Comm) System program conducted extensive tests and analysis using the HF media for tactical communications with low-flying aircraft. The use of the near-vertical-incidence skywave (NVIS) portion of the HF channel for aircraft communications is described. The HF-SSB radio systems have the capability of operating in either a ground wave or NVIS mode. For the NVIS mode, the energy is directed vertically to the ionosphere and returned to the surface of the earth. The NVIS mode provides umbrella type coverage. Because of NVIS propagation, HF-SSB systems with appropriate antennas have the capability of providing communications coverage out to ranges greater than 50 km in any type of terrain. The NVIS mode is terrain independent. The characteristics of the HF NVIS mode are considered and the features required of a modern HF radio system to make efficient and practical utilization of the already overcrowded HF band are noted. A.R.H.

N80-19376# Barry Research Corp., Sunnyvale, Calif.
REAL-TIME ADAPTIVE HF FREQUENCY MANAGEMENT
Robert B. Fenwick and Terence J. Woodhouse *In* AGARD Spec. Topics in HF Propagation Nov. 1979 14 p (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

In 1972 the United States Air Force began a program aimed at improving tactical HF communications. The approach involved measurement in real time of the important unknowns: propagation, noise, and spectrum occupancy, and adapting operating frequencies in real-time to the conditions measured. A potential problem with this approach is causing harmful interference to other spectrum users. An exercise called TROPHY DASH III was conducted to assess the ability of a particular technique to permit real-time selection of frequencies while yielding acceptably low interference. TROPHY DASH III results are viewed as significant. First, in spite of extensive notification of other spectrum users, negligible interference was reported. Based upon these results, real-time adaptive sharing of the HF spectrum in the tactical theater appeared both valid and feasible for a limited number of high-priority users, and procurement of the AN/TRQ- 35(V) Tactical Frequency Management System was authorized. Author

N80-19377# Royal Aircraft Establishment, Farnborough (England). Radio and Navigation Dept.
ASSESSMENT OF HF COMMUNICATIONS RELIABILITY
N. M. Maslin *In* AGARD Spec. Topics in HF Propagation Nov. 1979 12 p refs (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

The concept of circuit reliability for an HF sky-wave link is discussed. Its frequency dependence is considered together with the relationship to the median received signal-to-noise ratio for a given HF circuit. The importance of a study of this kind is the ability to be able to quantify changes that could be made for an HF circuit, in terms of reliability improvements, and hence to make decisions of the cost effectiveness of increasing transmitter power, antenna efficiencies, directional antenna design. A.R.H.

N80-19378# Forschungsinstitut der Deutschen Bundespost, Darmstadt (West Germany).
COMPARISON OF MEASURED AND PREDICTED MUF'S AT A REMOTE LOCATION
Th. Damboldt *In* AGARD Spec. Topics in HF Propagation Nov. 1979 6 p refs (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

The times at which the signals are received first and last by ionospheric propagation during the diurnal cycle define the times where the frequency of the transmitted signal is equal to the path MUF (maximum usable frequency). Values of these transition times are taken from the field-strength records of a path from England to Germany and then compared with the predicted values. A further comparison is made between the observed MUF transition times and the ionogram critical frequencies at the approximate path mid-point, i.e., de Bilt in Holland for the above mentioned path. Good agreement is obtained between the ionogram critical frequencies and the measured MUF's. It is suggested that information obtained from signal-strength records can lead to substantial improvements in MUF predictions. This is of considerable importance since operational requirements usually exist for real-time situations and not for the average conditions computed by prediction programmes. A.R.H.

N80-19379# Mission Research Corp., Santa Barbara, Calif.
AUGMENTATION OF HF PROPAGATION
T. J. Barrett *In* AGARD Spec. Topics in HF Propagation Nov. 1979 13 p refs (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

It appears that chemical releases might be employed to scatter communication signals for limited critical periods. This technique is an augmentation to be used in the event of an emergency, or an apparent emergency. The technique, while short-lived, does provide communication coverage over vast areas (approximately 3000 mile range). In a nuclear environment, the chemical ion cloud allows the use of VHF transmissions, rather than HF, thus greatly reducing blackout durations. Assessing the nuclear environment provides information to avoid blackout caused by beta particle ionization and allows choice of optimum cloud location. This technique does not replace any current communication system but does provide a way to maintain communications for a few minutes which might otherwise be blacked out for hours. Potential applications of this technique include communication with NATO, fleets, subforces, SAC, and other tactical communications. Author

N80-19380# General Electric Co., Syracuse, N.Y.
TROPOSPHERIC EFFECTS ON HF PROPAGATION
George H. Millman *In* AGARD Spec. Topics in HF Propagation Nov. 1979 14 p refs (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

An evaluation is made of the effect of tropospheric refractive bending on the propagation of HF radio waves. The index of refraction in the troposphere is modeled in terms of the CRPL Reference Refractivity Atmosphere-1958, while the index of refraction in the ionosphere is defined in terms of the transverse-ordinary mode of propagation, the electron density being represented by a Chapman model. Ray tracings are performed based on the assumption that the propagation media are stratified into layers of constant refractive index. The ground scatter distance and the true and virtual reflection heights are calculated as a function of surface refractivity and various electron density profiles. The relationship between radar range and target-ground distance is also examined. The existence of long range propagation paths beyond 4500 km for specific tropospheric and ionospheric conditions is discussed. Author

N80-19381# National Oceanic and Atmospheric Administration, Boulder, Colo. Space Environment Lab.
TOWARD GLOBAL MONITORING OF THE IONOSPHERE IN REAL TIME BY A BOTTOMSIDE NETWORK: THE GEOPHYSICAL REQUIREMENTS AND THE TECHNOLOGICAL OPPORTUNITY
J. W. Wright and A. K. Paul *In* AGARD Spec. Topics in HF Propagation Nov. 1979 21 p refs (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

Various aspects of a proposed ionospheric sounding network are discussed. This network is composed of modern, digital ionosondes that are fully computer-interactive. These ionosondes could provide vertical incidence and oblique incidence ionograms, signal amplitude, direction of arrival information and polarization. The advantages of such a network of sophisticated ionosondes are outlined. J.M.S.

N80-19382# Polytechnic Inst. of New York, Farmingdale. Dept. of Electrical Engineering.
HYBRID RAY-MODE FORMULATION OF TROPOSPHERIC PROPAGATION
S. H. Cho, C. G. Migliora, and L. B. Felsen *In* AGARD Spec.

Topics in HF Propagation Nov. 1979 15 p refs (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

A method of analyzing radio propgation using a combination of ray and mode theory is addressed. Using as an illustration the propagation of radio waves in an elevated tropospheric duct, the emphasis is given to how the hybrid ray-mode approach could be readily applied to a number of different propagation related problems across the frequency spectrum. J.M.S.

N80-19383# Centre National d'Etudes des Telecommunications, Lannion (France).
THE INFLUENCE OF IONOSPHERIC MODELS ON CALCULATIONS OF DECAMETRIC WAVE PROPAGATION [INFLUENCE DES MODELES D'IONOSPHERE SUR LES CALCULS DE PROPAGATION DES ONDES DECAMETRIQUES]
R. Fleury and P. Gounvaz *In* AGARD Spec. Topics in HF Propagation Nov. 1979 14 p refs In FRENCH; ENGLISH summary (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

The ionospheric F2-layer critical plasma frequency foF2 is one key geophysical parameter among those involved in HF wave propagation. This means that the efficiency of numerical methods available for HF waves propagation simulation (e.g., ray tracing) is greatly limited by the uncertainties inherent to the foF2 input models. Observed planetary distributions of monthly median foF2 and those calculated by current models which give values of error bars on foF2 are compared systematically. Further, an accurate ray tracing method used with F2-region models in which foF2 is perturbed in amounts equal to typical values of its error bars helps to assess the influence of these error bars on HF waves propagation results. A.R.H.

N80-19384# Illinois Univ. at Urbana-Champaign, Urbana. Dept. of Electrical Engineering.
METHODS OF DETERMINING IONOSPHERIC STRUCTURE FROM OBLIQUE SOUNDING DATA
R. E. DuBroff, N. Narayana Rao, and K. C. Yeh *In* AGARD Spec. Topics in HF Propagation Nov. 1979 16 p refs (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

The problem of determining ionospheric conditions from swept frequency oblique backscatter ionograms is considered. Emphasis is given to the methods developed to obtain an estimate of the equivalent electron density profile that results from the inversion of backscatter measurements. J.M.S.

N80-19385# Naval Research Lab., Washington, D. C. Communication Sciences Div.
THE GEOMORPHOLOGY OF THE HF BREAKTHROUGH PHENOMENON
John M. Goodman *In* AGARD Spec. Topics in HF Propagation Nov. 1979 13 p refs (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

The morphological behavior of HF radio waves that propagate through the ionosphere and are observed at satellite levels is described. Using realistic models the types of information about the ionospheric structure that could be deduced from satellite measurements of ground-based HF signals of HF noise sources are studied. J.M.S.

N80-19386# Institut fuer Astrophysik und Extraterrestrische Forschung, Bonn (West Germany).
COUPLING BETWEEN THE NEUTRAL AND IONIZED UPPER ATMOSPHERE DURING DISTURBED CONDITIONS
G. W. Proelss *In* AGARD Spec. Topics in HF Propagation Nov. 1979 14 p refs (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

Classical ground-based ionospheric data coupled with satellite observation are used to unravel the problems associated with understanding the dynamics of the ionosphere during a geomagnetic storm. It is indicated that the Earth's ionized atmosphere cannot be understood and predicted in the absence of comparable knowledge about the neutral atmosphere. J.M.S.

N80-19387# Ionospharen-Institut Breisach (West Germany).
BASIC FINDINGS HELPFUL FOR IONOSPHERIC PREDICTIONS
E. Harnischmacher and K. Rawer *In* AGARD Spec. Topics in HF Propagation Nov. 1979 10 p refs (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

The day-to-day fluctuations in the ionospheric parameters and how they appear tied to lunar includences are considered. In addition, the apparent planetary influences on the observed behavior of the F2 region critical frequency is discussed. J.M.S.

N80-19388# Centre National d'Etudes des Telecommunications, Lannion (France).
ON DETERMINING THE MAXIMUM USABLE FREQUENCY (MUF) [SUR LA DETERMINATION DE LA MUF CLASSIQUE]
R. Hanbaba *In* AGARD Spec. Topics in HF Propagation Nov. 1979 9 p refs In FRENCH (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

Calculation of the highest frequency at which radio waves can be propagated by ionospheric reflection between two given points is generally based on a representation of the propagation mode by a rectilinear path between the ground and the points in the ionosphere. By adopting Bradley and Dudeney's quasi parabolic model of variation with the altitude of the electric concentration, analytical expression can be obtained for the length of the ionospheric leap, the MUF, and the elevation angle of the radio path. However, for practical applications, it is necessary to use as simple a method as possible. A 'manual' method for determining the MUF and the elevation angle of the radioelectric path is presented. Transl. by A.R.H.

N80-19389# Air Force Geophysics Lab., Hanscom AFB, Mass.
CHARACTERISTICS OF THE HIGH LATITUDE IONOSPHERE PRODUCED BY AURORAL PARTICLE PRECIPITATION
James A. Whalen *In* AGARD Spec. Topics in HF Propagation Nov. 1979 12 p refs (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

The general domains of the high lattidue ionosphere are described. How these domains relate in space and time to general magnetospheric domains and how these relations aid the understanding of high frequency propagation in the high latitudes is discussed. R.E.S.

N80-19390# Institute for Telecommunication Sciences, Boulder, Colo.
PERSPECTIVE ON THE PREDICTION OF AURORAL ABSORPTION
Vaughn Agy *In* AGARD Spec. Topics in HF Propagation Nov. 1979 16 p refs (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

Methods for the calculation of the effects of auroral absorption on high frequency (HF) communication circuits (or HF radar) are briefly described. The riometer is discussed in detail as the best method for establishing an adequate data base for the prediction of auroral absorption effects on HF communication circuits. The reasons to explain why, after 25 years of riometer measurement, there is still no adequate data base are reviewed. Questions remain about the geographic distributions, the temporal variations, and the relationships with polar cap absorption on one hand, and with magnetospheric substorms on the other. These questions are stated and briefly examined. R.E.S.

N80-19391# Communications Research Centre, Ottawa (Ontario). Dept. of Communications.
DIRECTION AND DOPPLER CHARACTERISTICS OF MEDIUM AND LONG PATH HF SIGNALS WITHIN THE NIGHT-TIME SUB-AURORAL REGION
R. W. Jenkins, E. L. Hagg, and L. E. Montbriand *In* AGARD Spec. Topics in HF Propagation Nov. 1979 18 p refs Sponsored in part by AFGL (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

During 1976, the large receiving array near Ottawa was used to record high frequency (HF) transmissions from a USAF Geophysics Laboratory aircraft 2000 km away over the northwest

Atlantic on four evening flights. Geomagnetic conditions ranged from quiet to active. Signals from individual array elements were separately recorded, and later analyzed to provide the Doppler shift and direction of the signal. Also used were oblique ionograms recorded on the aircraft for a similar path. The F-mode maximum usable frequencies (MUF) were below 5 MHz for the major portions of all evening flights. However, several weaker modes were observed to be present at much higher frequencies. They were examined for their potential utility in extending HF communications and surveillance. It is concluded that the Sporadic-E and skip-distance-focussed ground-sidescatter modes present an opportunity for limited HF operations in the subauroral region during evening hours, when very low F-mode MUF's would otherwise make such operations impossible. R.E.S.

N80-19392# Rome Air Development Center, Hanscom AFB, Mass.

RECENT ADVANCES IN HF PROPAGATION SIMULATION

Terence J. Elkins *In* AGARD Spec. Topics in HF Propagation Nov. 1979 17 p refs (For primary document see N80-19372 10-32)

Avail: NTIS HC A25/MF A01

The recent developments in high frequency propagation simulation are summarized. Practical applications of the developments are discussed. R.E.S.

N80-19393# James Cook Univ. of North Queensland, Townsville (Australia). Dept. of Physics.

TRANSEQUATORIAL PROPAGATION THROUGH EQUATORIAL PLASMA BUBBLES: DISCRETE EVENTS

M. L. Heron *In* AGARD Spec. Topics in HF Propagation Nov. 1979 10 p refs (For primary document see N80-19372 10-32)

Avail: NTIS HC A25/MF A01

Recent results from the Jicamarca radar facility and satellite-borne plasma density probes have provided the general characteristics of rising depletions in the evening ionospheric plasma over the equator. The depletions are not spherical bubbles but extend along the magnetic field lines so that their feet are always in the lower F region. The bubbles are driven by E x B fields. Generally they move with the background ionosphere horizontally towards the east at about 125 m/s, but often they have a vertical component as well. A propagation model was developed, which uses the observed characteristics of the bubbles to predict radio wave guiding along the depleted tubes. The numerical model is set up to calculate power, Doppler shift, elevation and azimuth at the receiver of a transequatorial transmitter-receiver pair of stations. The numerical model was successfully evaluated in terms of a few observations of transequatorial propagation events. R.E.S.

N80-19394# Max-Planck-Institut fuer Aeronomie, Katlenburg-Lindau (West Germany).

THE PHENOMENOLOGY OF TRANSEQUATORIAL RADIO PROPAGATION UNDER SPREAD-F CONDITIONS

J. Roettger *In* AGARD Spec. Topics in HF Propagation Nov. 1979 9 p refs (For primary document see N80-19372 10-32)

Avail: NTIS HC A25/MF A01

Three special phenomena of transequatorial propagation are described: (1) the frequency dependence of off-great-circle path points to steep horizontal gradients of ionization, caused by the spatial resonance effect in the postsunset equatorial F region; (2) the small scale irregularities of the equatorial spread F which are generated at the steep gradients give rise to strong amplitude fluctuations of transequatorial signals; (3) the upward rising depletions of ionization can duct and scatter very high frequency signals over distances of more than 6000 km. Author

N80-19395# Max-Planck-Institut fuer Aeronomie, Katlenburg-Lindau (West Germany).

DETECTION, RANGING AND DRIFTSPEED MEASUREMENTS OF EQUATORIAL IONOSPHERIC IRREGULARITIES BY MEANS OF AIRGLOW OBSERVATIONS

G. Lange-Hesse and H. Lauche *In* AGARD Spec. Topics in HF Propagation Nov. 1979 7 p refs (For primary document see N80-19372 10-32)

Avail: NTIS HC A25/MF A01

Measurements of the emission rate distribution of the red oxygen line lambda = 630 nm in the night airglow with a panorama photometer at Tsumeb, Namibia show the occurrence of distinct airglow irregularities in the equatorial region. These irregularities are associated with irregularities in the electron density of the ionospheric F2-layer and show a nearly constant eastward drift with a average speed of about 100 m/s. The drift to the east is superimposed by an irregular movement to the south and north with a speed of about 200 m/s and more. R.E.S.

N80-19396# Leicester Univ. (England). Dept. of Physics.

HF WAVEFRONT IRREGULARITIES OBSERVED ON A LARGE APERTURE RECEIVING ARRAY

T. B. Jones and E. C. Thomas *In* AGARD Spec. Topics in HF Propagation Nov. 1979 11 p refs (For primary document see N80-19372 10-32)

Avail: NTIS HC A25/MF A01

The wavefronts of HF signals received on a large receiving array are investigated for a range of propagation conditions. The array consists of seven vertical elements spaced in a minimum redundancy configuration. The phase and amplitude on each element are measured and the whole array scanned every 0.1 sec. Signals received via ground waves and sky waves are investigated. The curvature of the wave front of the ground wave signals enables the location of the transmitter to be determined. The sky wave signals exhibit a wide variety of disturbance features. An attempt is made to relate these to the corresponding reflections in the ionosphere. K.L.

N80-19397# Army Communications Command, Fort Huachuca, Ariz.

A SPORADIC E PREDICTION TECHNIQUE

Miles A. Merkel and Roberto Rubio *In* AGARD Spec. Topics in HF Propagation Nov. 1979 8 p refs Prepared in cooperation with Atmospheric Sciences Lab., White Sands Missile Range, N. Mex. (For primary document see N80-19372 10-32)

Avail: NTIS HC A25/MF A01

A Sporadic E assessment technique was developed and implemented on electronic computer to facilitate computations and comparisons with experimental data. Very good agreement was found with the data in the mid-latitudes. Recommendations are made for approaches which should improve the accuracy and reduce computer run time. K.L.

N80-19398# Rome Air Development Center, Hanscom AFB, Mass. Electromagnetic Sciences Div.

SCATTER INJECTION/DUCTED MODE HF RADAR

Gary S. Sales *In* AGARD Spec. Topics in HF Propagation Nov. 1979 10 p refs (For primary document see N80-19372 10-32)

Avail: NTIS HC A25/MF A01

An extended range HF radar that uses Earth detached propagation modes to minimize losses was developed for detecting missile induced ionospheric perturbations. The ability of artificially generated irregularities to facilitate the injection/ejection of HF signals into ducted modes was studied theoretically. K.L.

N80-19399# Instituto Nacional de Meteorologia e Geofisica, Lisbon (Portugal).

IONOSPHERIC EFFECTS OF A SOLAR ECLIPSE IN THE CAPE VARDE ISLANDS [EFFETS IONOSPHERIQUES D'UNE ECLIPSE SOLAIRE DANS LES ILES DU CAP VERT]

A. S. Mendes, F. Bertin, P. Vila, and J. Papet-Lepine *In* AGARD Spec. Topics in HF Propagation Nov. 1979 4 p refs In FRENCH; ENGLISH summary Prepared in cooperation with Centre National d'etudes Telecommunications Issy-les-Moulineaux (France). (For primary document see N80-19372 10-32)

Avail: NTIS HC A25/MF A01

The installation of two ionosondes at SAL (Cape Verde, Islands) and at Ascension Island (conjugate point to SAL) as well as three polarimeters at SAL, DAKAR and BATHURST (Gambia) in addition to the permanent ionosonde in DAKAR made it possible to detect various ionospheric effects of the eclipse. The passage of the entire eclipse at supersonic speed seems to have produced a gravity wave front due to the cooling. The simultaneous foF2 and total electron content minima determine the initial time for the passage of a gravity-wave-like wake with a velocity around 250 ms/1 and whose fundamental period is 18 mn. The ionospheric electric field perturbation is due to the ionization loss in the E region dynamo in a cylindrical

region of 500 km radius. As a result of the upper F region 10 : 45 to 11 : 00 UT without any ionization loss at these levels. A thermospheric contraction flux appearing 20 mn after the eclipse maximum as well as a forced thermal diffusion flux were also noted. The results were essential for interpreting the more complex variations observed at subtropical and equatorial stations. A.R.H.

N80-19400# Birmingham Univ. (England).
GROUND-WAVE AND SKY-WAVE SEA-STATE SENSING EXPERIMENTS IN THE UNITED KINGDOM
E. D. R. Shearman, W. A. Sandham, E. N. Bramley, and P. A. Bradley *In* AGARD Spec. Topics in HF Propagation Nov. 1979 11 p refs Prepared in cooperation with the Science Research Council, Slough (England) (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

The use of gound wave MF/HF radar and sky wave HF radar for sensing wave characteristics and surface currents was studied. Ground wave experiments revealed a marked dependence of echo amplitude on sea state for 77 m waves as a function of the wind dependent long wavelength cut-off of the sea spectrum. The 0.01 Hz Doppler resolution employed permitted identification of island and ship echoes with ships being tracked out to a 210 km range. Using synthetic aperture technique, wave directional features were established and correlated with wind data. A sky wave radar project involving on-line digital processing was initiated for daily monitoring of the North Atlantic at ranges from 1,000-3,000 km over a 60 deg arc. Comparisons are reported of radar deduced surface wind directions and magnitudes with those measured in oceanographic vessels. An extension of the statistical theory used in the analysis of radar spectra is presented. K.L.

N80-19401# Toulouse Univ. (France).
SEA-STATE DIRECTIONAL SPECTRA OBSERVED BY HF DOPPLER RADAR [ESTIMATION DU SPECTRE DIRECTIONNEL DES VAGUES PAR RADAR DECAMETRIQUE COHERENT]
P. Broche *In* AGARD Spec. Topics in HF Propagation Nov. 1979 12 p refs In FRENCH; ENGLISH summary (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

The principal elements used in describing the sea surface, and the fundamental phenomena implied in the backscattering of the electromagnetic waves by this surface are reviewed. Results of experiments performed with a ground-wave HF Doppler radar are presented and compared with a sea-truth supplied by conventional oceanographic means. Two points are stressed: the estimation of the wind direction, by measuring the ratio of the amplitudes of the two Bragg lines in the doppler spectrum of the backscattered H.F. wave; and the estimation of the dominant frequency in the sea-state spectrum and of the significant height of the waves by measuring the cut-off frequencies which are present on both sides of the Bragg lines. A.R.H.

N80-19402# SRI International Corp., Menlo Park, Calif.
DEVELOPMENT OF HF SKYWAVE RADAR FOR REMOTE SENSING APPLICATIONS
Taylor W. Washburn, Lawrence E. Sweeney, Jr., James R. Barnum, and Walter B. Zavoli *In* AGARD Spec. Topics in HF Propagation Nov. 1979 17 p refs (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

The capabilities of HF radar are discussed along with radar techniques and propagation management tools used to maximize radar performance. Methods are described for inferring radar sensitivity from cluster to noise measurements, minimizing interference problems in the crowded HF spectrum, and using the swept frequency continuous wave signal format to separate small moving targets from clutter and observe fine details within the clutter itself. K.L.

N80-19403# SRI International Corp., Menlo Park, Calif.
HF SKYWAVE RADAR ESTIMATES OF THE TRACK, SURFACE WIND AND WAVES OF HURRICANE ANITA
Joseph W. Maresca, Jr. and Christopher T. Carlson *In* AGARD Spec. Topics in HF Propagation Nov. 1979 13 p refs Presented at the Conf. on Coastal Eng., Hamburg, West Germany, Aug. 1978 (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

The track of Hurricane Anita and the intensity of the surface wind and waves throughout the storm were estimated from high frequency skywave radar sea echo Doppler spectra measurements made over 3000 km away from the storm. Twenty-one maps of the surface wind direction within 250 km of the eye were generated. A track was computed from estimates of the hurricane center made from each wind direction map. Spatially averaged hurricane wind-speed, wind-direction, arid wave-height radar estimates were compared to point measurements made at NDBO buoys and by reconnaissance aircraft. Agreement was within the nominal measurement accuracy of all the sensors. Comparison of point current measurement made nearly 290 km apart during *Anita* by the radar and moored open-ocean current meters show reasonable agreement. These experiments indicate that during a hurricane, HF skywave radar can provide operational surface data that are as accurate as the more recognized in-situ measurements. K.L.

N80-19404# SRI International Corp., Menlo Park, Calif.
OCEAN SWELL PARAMETERS FROM NARROW-BEAM HF RADAR SEA ECHO
Belinda Lipa and Donald Barrick *In* AGARD Spec. Topics in HF Propagation on Nov. 1979 12 p refs Prepared in cooperation with NOAA Wave Propagation Lab., Boulder, Colo. (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

Inversion methods are described for studying the HF radar sea-echo Doppler spectra, giving parameters of the ocean wave spectrum in the important long wavelength region. Radar spectra exhibiting very narrow spikes in the higher-order structures adjacent to the first-order lines are indicative of ocean swell with a single dominant wavelength; it is shown how to interpret such a radar spectrum to give swell period, direction and rms waveheight. When the higher-order echo peaks are more spread in frequency, a simple model for the swell yields a closed-form expression for the four second-order swell peaks; parameters identifiable from this model, in addition to swell rms height, direction, and dominant period, include the angular spread and frequency spread of the swell. Finally, when the swell Doppler peaks are quite spread, it is shown how to use integral inversion to give Fourier coefficients of the ocean-wave spectrum as a function of ocean wavelength. At a given wavelength these coefficients are interpreted in terms of a cardioid model for the angular distribution to give the mean wave direction and the angular spread. In normal surface-wave experiments, the major source of error or noise is the random surface height of the sea; the resulting statistics of the radar spectrum, are described and the propagation of uncertainty to the derived ocean parameters is traced. M.G.

N80-19405# Colorado Univ. at Boulder. Cooperative Inst. for Research in Environmental Sciences.
PRINCIPLES OF HF COMMUNICATION IN TUNNELS USING OPEN TRANSMISSION LINES AND LEAKY CABLES
James R. Wait, David A. Hill, and David B. Seidel *In* AGARD Spec. Topics in HF Propagation Nov. 1979 4 p refs (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

The concept that electromagnetic waves can be guided by tunnels is covered. It is shown that the frequency must be greater than some cut-off value that typically is of the order of 50 MHz. When the tunnel contains axial conductors, the situation is changed dramatically, and there is no cut-off as such, although wave-guide type modes also propagate at the higher frequencies. J.M.S.

N80-19406# Universite Catholique de Louvain (Belgium). Laboratoire de Telecommunications et d'Hyperfrequences.
MODE CONVERTERS FOR HF TUNNELS TRANSMISSION
P. Delogne *In* AGARD - Spec. Topics in HF Propagation Nov. 1979 14 p refs (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

Leaky feeder techniques used to guide electromagnetic waves in tunnels are discussed. These systems are based on the coupling

of the coaxial or bifilar mode with the monofilar mode. In contrast with the principle of continuous leaky feeders one can use discrete mode converters spaced along a nonleaky cable. After an analysis of the general properties of mode converters, a detailed description of various types is given: selective and wideband annular-slot converters for coaxial cables, leaky section, selective, and wideband converters for two-wire lines. M.G.

N80-19407# Queens Univ., Kingston (Ontario). Dept. of Electrical Engineering.

LEAKY COAXIAL CABLES FOR OBSTACLE DETECTION AND CONTINUOUS ACCESS GUIDED COMMUNICATIONS

N. A. M. Mackay, J. C. Beal, D. J. Gale, and J. L. Mason *In* AGARD Spec. Topics in HF Propagation Nov. 1979 11 p refs (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

Leaky coaxial cables utilized for continuous access guided communications and as a guiding medium in an obstacle detection scheme called guided radar are discussed. Techniques for predicting the performance of leaky cable installations in a variety of configurations are examined. A two-cable cavity resonantor test allows the coupling effectiveness of different cable designs to be measured in the laboratory, in free space, or in the presence of different surrounding environments. An associated theoretical treatment is developed, based upon extensions of coupled transmission line theory. This theoretical model of the cavity is extended to simulate a full scale guided radar system. M.G.

N80-19408# California Univ., Livermore. Lawrence Livermore Lab.

DEFINITION OF SUBSURFACE FEATURES BY GEOPHYSICAL PROBING

R. J. Lytle *In* AGARD Spec. Topics in HF Propagation Nov. 1979 7 p refs (For primary document see N80-19372 10-32) (Contract W-7405-eng-48)
Avail: NTIS HC A25/MF A01

An overview of advances in near surface geophysical probing is presented. Mathematical studies are covered as well as laboratory and controlled in-situ experiments. Developments in instrumentation, data processing, and data interpretation are included. J.M.S.

N80-19409# Lille Univ. (France). Dept. Electronique.

EXPERIMENTAL RESULTS ON THE FREE PROPAGATION OF UHF WAVES IN TUNNELS [RESULTATS EXPERIMENTAUX CONCERNANT LA PROPAGATION LIBRE DES ONDES UHF DANS LES TUNNELS]

P. Degauque, P. Mangez, B. Demoulin, and B. Gabillard *In* AGARD Spec. Topics in HF Propagation Nov. 1979 16 p refs In FRENCH (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

In mine passageways and generally in certain tunnels, it can be useful to establish radio communication over several hundred meters, if possible, with the aid of portable equipment. For this purpose radio communication in the high frequency range (400 MHz to 1 GHz) appears interesting. In fact, in this frequency band, the length of the wave is small enough in relation to the dimensions of the passage so that the dominant modes to be propagated correspond to rays which are reflected under grazing incidence. In this case, only a small amount of energy is lost by refraction on the walls. The loss obtained for different types of tunnels is presented. The case of rectilinear tunnels are considered first, and the influence of transverse geometry of the passageway and the roughness of the walls is demonstrated. Supplementary losses undergone by the wave when the tunnel contains one or more curves are also discussed.
Transl. by A.R.H.

N80-19410# Institute for Telecommunication Sciences, Boulder, Colo.

EXCITATION OF THE HF SURFACE WAVE BY VERTICAL AND HORIZONTAL APERTURES

James R. Wait and David A. Hill *In* AGARD Spec. Topics in HF Propagation Nov. 1979 11 p refs (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

An exposition of the normal mode approach to ground wave propagation is presented. This formulation is adapted to the solution of the surface wave excitation problem. The principal end result is the residue series representation for the vertical electric field over a spherical earth when excited by either a vertical or a horizontal antenna. The derivation incorporates the essential features of prior analyses without becoming embroiled in the mathematical niceties of branch cuts and intricate and tricky deformation of integration contours in the complex wave number planes. J.M.S.

N80-19411# Liege Univ. (Belgium). Inst. Physique.

EFFECTIVE USE OF NATURAL MODES IN VHF AND UHF TUNNEL PROPAGATION

L. Deryck *In* AGARD Spec. Topics in HF Propagation Nov. 1979 15 p refs (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

An experimental study of the electromagnetic wave propagation in various tunnels, at frequencies between 1 MHz and 1,000 MHz is presented. The results obtained provide a better understanding of natural propagation mechanisms in underground galleries containing no transmission line. The analysis of these results reveals the existence of a cutoff frequency and a strong correlation between the propagation characteristics and the transverse dimensions of the tunnel. Further experiments are made in tunnels where a transmission line is used as a waveguide; they show under what conditions the natural modes can be useful in this case. These modes can advantageously replace the so-called monofilar mode which is generally used for coupling between the transmission line and the mobile transceivers. Experimental checking shows that when using a well adapted transmission line, exploitation of natural propagation can greatly reduce the cost of the line installation without reducing its performance. Author

N80-19412# Institute for Telecommunication Sciences, Boulder, Colo.

COMPARISON OF LOOP AND DIPOLE ANTENNAS IN LEAKY FEEDER COMMUNICATION SYSTEMS

David A. Hill and James R. Wait *In* AGARD Spec. Topics in HF Propagation Nov. 1979 9 p refs (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

The mutual impedance between electric and/or magnetic dipoles in a circular tunnel containing a leaky coaxial cable was derived for arbitrary dipole positions. For the usual case of large dipole separation, the bifilar mode approximation was used to compute the mutual impedance and associated transmission loss. For typical cable parameters, a broad minimum in transmission loss was found in the range from 2 to 10 MHz. In this frequency range, the transmission loss was slightly less for magnetic dipoles (loops) than for electric dipoles. R.C.T.

N80-19413# Colorado Univ. at Boulder. Cooperative Inst. for Res. in Environmental Sciences.

MODE CONVERSION BY TUNNEL NON-UNIFORMITIES IN LEAKY FEEDER COMMUNICATION SYSTEMS

David B. Seidel and James R. Wait *In* AGARD Spec. Topics in HF Propagation Nov. 1979 9 p refs (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

Using an idealized theoretical model, the inadvertent mode conversion between the bifilar and monofilar modes in a tunnel that contains a braided coaxial was investigated. The tunnel was allowed to have various kinds of lateral nonuniformities such as changes of wall conductivity and permittivity. Results indicate that such effects are very important in understanding leaky feeder systems. R.C.T.

N80-19414# James Cook Univ. of North Queensland, Townsville (Australia). Physics Dept.

A MOBILE HF IMPULSE SOURCE LOCATOR

M. L. Heron *In* AGARD Spec. Topics in HF Propagation Nov. 1979 9 p refs (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

A noise pulse locator designed to meet the needs of research into the structure of tropical cyclone (hurricane) systems but which may be easily adapted to storm location and tracking

applications is described. The principle and instrumentation of the noise pulse locator are discussed. The resolution, errors, and limitation of the equipment as deployed on an Orion aircraft are estimated and the areas of application and adaption of the instrument are noted. R.C.T.

N80-19415# Technology for Communications International, Mountain View, Calif.
A NEW COMPUTER-CONTROLLED HIGH FREQUENCY DIRECTION-FINDING AND TRANSMITTER LOCATING SYSTEM
R. L. Tanner *In* AGARD Spec. Topics in HF Propagation Nov. 1979 13 p refs (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

A direction finding and transmitter locating system is described. The following capabilities are evaluated: the ability to operate against very short duration signals with high accuracy; the ability against short range, high angle sky wave signals; single station locator capability; critical siting requirements; adaptability to automatic netting of a multistation system; and requirements for trained technical personnel. R.C.T.

N80-19416# Lowell Univ., Mass. Center for Atmospheric Research.
DIGITAL ON-LINE PROCESSING AND DISPLAY OF MULTIPARAMETER HF TRANSMISSION DATA
K. Bibl and B. W. Reinisch *In* AGARD Spec. Topics in HF Propagation Nov. 1979 9 p refs (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

Amplitude, phase, angle of arrival, polarization, frequency shift and signal travel time of a radio wave are simultaneously measured as functions of time and frequency in a new digital ionsonde, the Digisonde 128PS. For the study of the structure and motions of the ionosphere and its influence on Over-the Horizon detection systems, on sea-state measurements, on direction and location finding methods and on communication systems a selection of the measurable parameters is recorded and displayed in real time with the necessary resolution. Two main modes of operation are described, the ionogram mode using a Maximum Amplitude scheme for data compression and the Doppler-Drift Mode using preselected frequencies and range bins of data compression. Author

N80-19417# Communications Research Centre, Ottawa (Ontario). Dept. of Communications.
NEW TECHNOLOGY TO IMPROVE HF CIRCUIT RELIABILITY AND AVAILABILITY FOR REMOTE REGIONS
J. S. Belrose and L. R. Bode *In* AGARD Spec. Topics in HF Propagation Nov. 1979 11 p refs (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

The research and development underway at the Communications Center, Ottawa, is described along with that in Canadian Industry. Topics discussed include: (1) trail-remote camp radio communications, (2) antennas for base station and trail use, (3) HF-SSB Transceiver, and (4) SSB tone decoder. F.O.S.

N80-19418# Surrey Univ., Guildford (England).
ELECTRICALLY SHORT HF AERIAL SYSTEMS
M. N. Sweeting and G. V. Davis *In* AGARD Spec. Topics in HF Propagation Nov. 1979 21 p refs (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

The communications efficiency of electrically short HF aerials in a tactical field environment remains unacceptably poor. Some of results from a detailed, practical study of the problem, performed at full-scale are described and the effect on the aerial performance of several factors shown by the experiments to be important but not previously sufficiently recognized are discussed. F.O.S.

N80-19419# Rohde and Schwartz, Munich (West Germany).
RADIO-LINK COMPUTATIONS OPTIMIZE PATTERN SHARING OF SHORTWAVE ANTENNAS
A. Stark *In* AGARD Spec. Topics in HF Propagation Nov. 1979 17 p refs (For primary document see N80-19372 10-32)
Avail: NTIS HC A25/MF A01

Statistical data were obtained from forecast printouts to produce frequency-dependent, optimized values for the elevation angles of the radiation maximum and for the vertical beamwidths. R.C.T.

N80-19815# Forschungsinstitut fuer Funk und Mathematik, Werthoven (West Germany).
OBJECTIVES FOR BUILDING AN EXPERIMENTAL CCIS
Ingrid Hollinde *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 10 p refs (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

N80-19816# Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (West Germany).
SIMULATION OF OVERALL AIR DEFENSE COMMAND AND CONTROL
Reinhard Hutter *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 15 p refs (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

N80-19817# Department of the Air Force, Washington, D.C. Tactical Systems Div.
THEATER AIR DEFENSE ENGAGEMENT SIMULATION-COMMAND/CONTROL/COMMUNICATIONS (TADENS-C(3)) AN APPROACH TO THEATER AIR DEFENSE MODEL/METHODOLOGY DEVELOPMENT
Urban H. D. Lynch *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 13 p (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N80-19420 British Library Lending Div., Boston Spa (England).
S-BAND MIC TRAPATT AMPLIFIER
S. Yangagawa and M. Ohtomo Oct. 1979 23 p refs Transl. into ENGLISH from Denki Tsushin Gakkai Gijutsu Kenkyu Hokoku (Japan) p 76-78
(BLL-RTS-11884) Avail: British Library Lending Div., Boston Spa, Engl.

A 3 GHz band MIC Trappat amplifier for second harmonic extraction mode with a simpler circuit configuration than previously developed is described. An Si N(+) PP(+) diode is used, and in pulse operation conditions of pulse width 5 micron s and repetition frequency 1 KHz, broad bandwidth and high output-bandwidth of 200 MHz (output 70 W, gain 7 dB) and output of 90 W (bandwidth 87 MHz, gain 8.7 dB) are achieved. The temperature characteristics of the amplifier were improved by using a temperature compensation method in which a portion of an alumina substrate was replaced by a rutile ceramic substrate. This resulted in an amplifier with a stable bandwidth greater than or equal to 0.2 deg/C and output greater than or equal to 60 W (gain greater than or equal to 8.8 dB) in the temperature range -40 to approximately 70 C. Author

N80-19421 British Library Lending Div., Boston Spa (England).
MONTE CARLO SIMULATION FOR INTEGRATED CIRCUITS
Katsuro Sagane and Hideyasu Karasawa Oct. 1979 27 p refs Transl. into ENGLISH from Denshi Tsushin Gakkai Kairo to Shisutemu rir on Ken Shiro (Japan), CST-74, 1974 p 97-104
(BLL-RTS-11885; CST-74) Avail: British Library Lending Div., Boston Spa, Engl.

A method for generating multidimensional normal random numbers that is suited to Monte Carlo simulation of integrated

circuits is presented. The method makes it possible to generate random numbers with accurate correlations in a short time and using a smaller core size than that required by direct application of Moonan's method. In actual simulation, it is made possible to change mean values, total variance, and correlation of element parameters, as well as structure of these factors, and to easily examine results of making such changes. The main features of a program for this simulation and an example of its application are described. In the method two factors, inter-pellet factors and in-pellet factors, are considered as factors responsible for variability element parameters, but the method may be easily expanded to deal with multifactor structures taking into account interbatch, or interslice factors, etc. M.G.

N80-19422 British Library Lending Div., Boston Spa (England).
A MATHEMATICAL INVESTIGATION OF THE DYNAMIC RESISTANCE OF A DC ELECTRICAL MACHINE
J. Hazdra P. Sos Oct. 1979 11 p ref Transl. into ENGLISH From Elektrotech. Obz. (Czechoslovakia), v. 67, no. 8, 1978 p 488-490
Avail: British Library Lending Div., Boston Spa, Engl.

A method for determining the probability of flashover in dc machines is discussed based on the time behavior of the current through the armature and the speed of the machine during a transition process of some kind. M.G.

N80-19423 British Library Lending Div., Boston Spa (England).
MINIATURE SYNCHRONOUS MOTORS WITH PERMANENT MAGNET ROTORS
H. Gerber Oct. 1979 31 p Transl. into ENGLISH from Neue Tech. (Switzerland), v. 15, no. 10, 1973 p 382-392
(BLL-RTS-11801) Avail: British Library Lending Div., Boston Spa, Engl.

The design of miniature synchronous motors with permanent magnet rotors is reviewed. The motors are defined as single phase motors running in synchronization with the mains and which include all those motor variants whose rotors possess permanent magnetic poles. Three designs of the magnet rotors are distinguished. They are rotors with an alternating stator field and reverse running lock, with a rotating stator field and reverse running lock, and with a rotating stator field and an electromagnetically determined direction of rotation. The principles and functions of the motor are defined for each design. The general characteristics of the motor are described including the high torque, the efficiency, and the rotor's running speed and starting torque. A.W.H.

N80-19424*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A LINEAR MAGNETIC MOTOR/GENERATOR Patent Application
Philip A. Studer, inventor (to NASA) Filed 7 Feb. 1980 27 p
(NASA-Case-GSC-12518-1; US-Patent-Appl-SN-119336) Avail: NTIS HC A03/MF A01 CSCL 09C

A linear magnetic motor/generator is described which uses magnetic flux to provide mechanical motion or electrical energy. The linear magnetic motor/generator includes an axially movable actuator mechanism. A permanent magnet mechanism defines a first magnetic flux path which passes through a first end portion of the actuator mechanism. Another permanent magnet mechanism defines a second magnetic flux path which passes through a second end portion of the actuator mechanism. A drive coil defines a third magnetic flux path passing through a third central portion of the actuator mechanism. The invention has potential applications on all types of spacecraft requiring the use of a motor or generator, or in environments requiring long life with minimum maintenance. Presently the invention is to be used in cryogenic refrigerators aboard future spacecraft. NASA

N80-19425*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COUPLED CAVITY TRAVELING WAVE TUBE WITH VELOCITY TAPERING Patent Application
Denis J. Connolly, inventor (to NASA) Filed 20 Feb. 1980 16 p
(NASA-Case-LEW-12296-1; US-Patent-Appl-SN-122966) Avail: NTIS HC A02/MF A01 CSCL 09A

A coupled cavity traveling wave tube is described which has a velocity taper, i.e., gradual velocity reduction, which affords beam wave resynchronization and thereby enhances efficiency. The required wave velocity reduction is achieved by reducing the resonant frequencies of the individual resonant cavities as a function of the distance from the electron gun through changes in the internal cavity dimensions. The required changes in cavity dimensions are accomplished, for example, by gradually increasing the cavity radius or decreasing the gap length from cavity to cavity. NASA

N80-19426*# Alabama Univ., University. Bureau of Engineering Research.
DEVELOPMENT OF MATHEMATICAL MODELS FOR SOLID STATE SWITCHING DEVICES Final Report
W. D. Raburn and J. C. Kim Jan. 1980 30 p
(Contract NAS8-33430)
(NASA-CR-161387; BER-249-25) Avail: NTIS HC A03/MF A01 CSCL 09A

Models are developed for two types of remote power controllers (RPC). The models give the equations for the currents and voltages for all elements of passive loads as a function of time for both turn-on and turn-off. It is shown that the RPC can be considered as a combination of current and voltage sources. Equations are given for these sources which are essentially independent of the load being turned on and off. Experimental results are given for several types of loads and comparisons are made with the results obtained using the models. R.C.T.

N80-19427*# Axiomatix, Los Angeles, Calif.
CRITIQUE OF A HUGHES SHUTTLE Ku-BAND DATA SAMPLER/BIT SYNCHRONIZER Interim Report
J. K. Holmes 14 Mar. 1980 29 p refs
(Contract NAS9-15795)
(NASA-CR-160556; R8003-1) Avail: NTIS HC A03/MF A01 CSCL 09C

An alternative bit synchronizer proposed for shuttle was analyzed in a noise-free environment by considering the basic operation of the loop via timing diagrams and by linearizing the bit synchronizer as an equivalent, continuous, phased-lock loop (PLL). The loop is composed of a high-frequency phase-frequency detector which is capable of detecting both phase and frequency errors and is used to track the clock, and a bit transition detector which attempts to track the transitions of the data bits. It was determined that the basic approach was a good design which, with proper implementation of the accumulator, up/down counter and logic should provide accurate mid-bit sampling with symmetric bits. However, when bit asymmetry occurs, the bit synchronizer can lock up with a large timing error, yet be quasi-stable (timing will not change unless the clock and bit sequence drift). This will result in incorrectly detecting some bits. A.R.H.

N80-19428# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
CHARACTERIZATION OF TUNGSTEN DISPENSER CATHODES USING ISS AND SIMS Final Report, Jan. - Jun. 1979
William L. Baun Oct. 1979 31 p refs
(AF Proj. 2303)
(AD-A077592; AFML-TR-79-4125) Avail: NTIS HC A03/MF A01 CSCL 09/1

Ion Scattering Spectrometry (ISS) and Secondary Ion Mass Spectrometry (SIMS) are used to characterize surface chemistry of barium-activated tungsten dispenser cathodes. Experiments were carried out at room temperature and at temperatures in which electron emission was occurring from the cathode structures. It was found that when the cathode structure was heated to a point at which electron emission began, barium concentration at the surface also increased. At that temperature, the barium is generated, transported through the porous tungsten matrix, and spread over the emitting tungsten surface. Apparently, sputtering rates from these barium rich surfaces were very high and when ion beams were used at conventional energies (1000 volts or more), the sputtering rate was sufficiently large to suggest that incomplete coverage of barium existed. When very low ion beam voltages were used (in the neighborhood of 200-300 volts), and beam rastering techniques were employed, then results showed that the surfaces following activation were completely covered by barium. Under these conditions of complete

barium coverage, no oxygen was observed. When the surface was sputtered and tungsten appeared, oxygen also increased, but not to a point to indicate a full oxide coating. A model of Ba bonded to O bonded to W is suggested. GRA

N80-19429# Autonetics, Anaheim, Calif. Strategic Systems Div.
SOLID STATE POWER CONTROLLER VERIFICATION STUDIES Final Technical Report, Oct. 1978 - Jan. 1979
Carl O. Linder Jan. 1979 195 p
(Contract F33615-78-C-2065; AF Proj. 3145)
(AD-A078238; C79-85/201; AFAPL-TR-79-2029) Avail: NTIS
HC A09/MF A01 CSCL 01/3

This report documents the design and test of the Solid State Power Controllers (SSPCs) for the B-1 aircraft. The SSPCs were in qualification testing when the B-1 program was terminated. The testing and completion of the B-1 SSPC program, considered crucial to the advancement of the state-of-the-art in SSPC technology, is concluded and documented in this report. This report documents the accomplishments of the B-1 SSPC program together with the results of the tests completed during the study. Recommendations for future SSPC activities are included in the final section. A proposed MIL-P-81653 specification is attached as Appendix A. Author (GRA)

N80-19430# Air Force Weapons Lab., Kirtland AFB, N. Mex.
MICROCRACKS AND METALLIZATION BURNOUT Final Report
Armen E. Mardiguian Sep. 1979 88 p refs
(AD-A078019; AFWL-TR-78-92) Avail: NTIS
HC A05/MF A01 CSCL 09/1

This report describes the work done to determine the extent to which the reliability of integrated circuits (ICs) suffers when those ICs contain small cracks (microcracks) in their metallization. It was hypothesized that microcracked devices would undergo metallization at lower current pulses than unmicrocracked devices. Six hundred triple three-input NAND gates manufactured by Texas Instruments were used, of which 300 had been deliberately processed to have microcracks. The devices were first examined under a scanning electron microscope and electrically characterized on the AFWL Fairchild 5000. Different batches of both cracked and uncracked devices were then subjected to pulses varying in pulse width from 10 ns to 500 ns. The short pulse widths assured approximately adiabetic conditions, for which development of a theory of metallization burnout (MBO) was relatively straight-forward. Postpulse testing revealed that there is no significant difference between the levels at which cracked and uncracked devices underwent MBO. Author (GRA)

N80-19431# Edgerton, Germeshausen and Grier, Inc., Salem, Mass. Electronic Components Div.
PLASMA CATHODE THYRATRON Final Report, 1 Sep. 1977 - 23 Feb. 1979
David Fleischer and David Turnquist Sep. 1979 64 p refs
(Contract DAAB07-77-C-2704; DA Proj. 1L1-62705-AH-94)
(AD-A078864; DELET-TR-77-2704-F) Avail: NTIS
HC A04/MF A01 CSCL 09/1

An instant-starting hydrogen thyratron is described which incorporates a cathode requiring no warmup time, no standby power, and no separate heater power supply. Starting cold, time jitter is less than 1 ns; anode delay time is less than 200 ns; and the 0-30 second anode delay time drift is less than 100 ns. The cathode is a self-heating design made of impregnated tungsten. Even when cold, it provides sufficient emission capability to trigger readily and to prevent arcing. During operation, it attains full operating temperature via plasma heating effects and its own resistive dissipation; after shutdown, it remains active, in readiness for the next cold start, a cycle which can be repeated as often as desired. Thyratrons made with the new cathode display operating behavior and life comparable to conventional hydrogen thyratrons of equivalent size. GRA

N80-19432# Hull Corp., Hatboro, Pa. Thinco Div. *
PROGRAM TO DESIGN, DEVELOPE, FABRICATE AND DELIVER THIN FILM CHIP INDUCTORS SUITABLE FOR HYBRID CIRCUIT APPLICATIONS Final Report
Stephen T. C. Chen Nov. 1979 32 p
(Contract N62269-78-C-0312; WF62580000)
(AD-A078840; NADC-78111-40) Avail: NTIS
HC A03/MF A01 CSCL 09/1

Inductors were fabricated using thin film techniques. The winding of an inductor was formed by depositing alternate layers of metal and dielectric material in steps of one-half turns. The optimization of Q-factor and self-resonant frequency were discussed. Comparison of circular and square geometry were made indicating that the circular one was preferred. Use of magnetic ferrite substrate to increase the inductance and the Q-factor has been achieved. Different methods for the measurements of inductance and Q-factor were described and the results of the measurement of a thin film inductor were given. GRA

N80-19433# Raytheon Co., Waltham, Mass. Microwave and Power Tube Div.
DUAL BEAM DUAL MODE TWT Bimonthly Progress Report, 15 Aug. - 15 Oct. 1978
Nov. 1978 47 p
(Contract N00014-78-C-0791)
(AD-A077576; PT-5289; BMPR-2) Avail: NTIS
HC A03/MF A01 CSCL 09/1

This report describes the activities during the first two months of a development program designed to bring an existing high-band dual mode TWT up to the recent JSC specification for dual mode tubes. Test vehicles for design verification testing have been designed and ordered, tube design has been carried out, tooling improvements have been implemented, and design work on a new waveguide transition and collectors is described. GRA

N80-19434# Naval Ship Research and Development Center, Bethesda, Md.
INVESTIGATION OF ELECTROPLATED ELECTRICAL CONTACTS Final Report, Oct. 1965 - Oct. 1978
William H. Kohlmann Oct. 1979 56 p
(ZF61412001)
(AD-A075353; DTNSRDC-79/092) Avail: NTIS
HC A04/MF A01 CSCL 13/8

The relative deterioration by marine atmospheres of noble metal platings for electric contacts has been determined in the interests of improving the reliability of electrical connections in the marine environment and of conserving precious metals. In cooperation with the Electronics Industry Association P-5.1 Committee on Electrical Contacts, this Center investigated the effects of marine and laboratory salt spray atmospheres on various contact platings in order to determine optimum platings; the emphasis was on platings with silver underplating. The work described includes establishment of experimental techniques, equipment development, a discussion of the marine exposure site at Ft. Tilden, New York, and the laboratory salt spray environment and procddures. The results with various platings show that the use of nickel as an underplating is very undesirable, but 30 millionths of an inch of gold over 100 millionths of an inch of silver is superior, and 30 millionths of an inch of gold over 100 millionths of an inch of copper is adequate in the marine environment. An examination of 4000 hours of laboratory salt spray exposure and 108,000 hours (11-1/2 years) of marine exposure indicates a corrosion acceleration factor ranging from 18 to 25 for gold-over-nickel plating systems. GRA

N80-19435# Autonetics, Anaheim, Calif. Strategic Systems Div.
FLAT BUS FAULT SENSORS Final Report, Oct. 1978 - Oct. 1979
Carl O. Linder Oct. 1979 48 p
(Contract N62269-78-C-0213)
(AD-A077060; C79-951/201; NADC-77336-60) Avail: NTIS
HC A03/MF A01 CSCL 09/3

This report documents the development of an electric power distribution fault sensing technique for use on a 270 Vdc, two wire, flat bus, ungrounded aircraft power distribution system for operation in composite aircraft structures. The effort, performed by the Strategic Systems Division of Rockwell International, included the development, fabrication and delivery of six fault sensor breadboards. Author (GRA)

N80-19436# Northrop Corp., Des Plaines, Ill. Defense Systems Div.
I/J BAND LOW-COST CROSSED-FIELD AMPLIFIER Interim

Technical Report, 30 Sep. 1978 - 30 Mar. 1979
Robert R. Moats Nov. 1979 47 p refs
(Contract DAAB07-78-C-2981; DA Proj. 1L1-62705-AH-94) (AD-A077322; DELET-TR-78-2981-1; Rept-094-009168; ITR-1) Avail: NTIS HC A03/MF A01 CSCL 09/5

This program is directed toward development of an I/J band, linear format, injected-beam crossed-field amplifier (IBCFA) for electronic warfare. The IBCFA should be capable of power output of 1000W peak, 200W average, between 8.5 and 17 GHz with 20 dB gain. A laser-cut shaped-substrate meander line is to be used. E/F band IBCFA's are to be built and evaluated for electronic warfare applications: 3 kW peak pulse power and 1 kW average power output, 20 dB gain, 2-4 GHz; and for phased-array radar, 2 kW peak pulse power output at 10-15% duty, 25 dB gain, 3.0-3.6 GHz. Objective specifications for I/J-band devices are 1 kW peak pulse power and 200W average power output, 20 dB gain, 8.5-17 GHz. A previously built E/F-band CFA with laser-cut substrate was tested to determine its performance with respect to the phased array requirements. It was concluded that additional circuit length is required for increased gain. In addition, it will be desirable to add attenuation in the small-signal part of the tube to improve stability in the electronic warfare mode. A first round of I/J-band large-signal calculations was performed. It was concluded that a circuit pitch of 0.014 in. is desirable, and that cathode-to-ground voltage should be about 6500 v. Author (GRA)

N80-19437# RCA Advanced Technology Labs., Camden, N. J.
ANALOG BINARY PROGRAMMABLE TRANSVERSAL FILTER Interim Report, 30 Sep. 1977 - 31 Aug. 1978
D. A. Gandolfo and J. R. Tower Jun. 1979 66 p refs
(Contract F19628-77-C-0263; AF Proj. 4600) (AD-A078860; RADC-TR-79-135) Avail: NTIS HC A04/MF A01 CSCL 09/5

The objective of this program is to develop a programmable CCD (Charge-Coupled Device) circuit capable of correlating a variety of binary-coded waveforms. This analog-binary correlator will store a binary waveform as a reference, and will then compare newly arriving signals to the reference waveform. In general, the signal will be a binary code that has been corrupted in the transmission channel so that upon arrival at the receiver, it really has an analog character (i.e., the amplitude varies continuously). Analog-binary correlation techniques have an important advantage over purely digital approaches. If the analog signal is directly compared to the reference, only a single correlation channel is required, whereas a digital correlator requires a separate channel for each bit of resolution in the analog-to-digital converter. Thus, a reduction in parts count, with attendant improvements in size, cost and reliability, is realized with the CCD correlator. The correlator is an important device because correlation of binary waveforms is a function widely used in spread spectrum systems, which offer important advantages for military communications and radar applications. Spread spectrum advantages include jam resistance, reduced detectability and improved signal-to-noise ratio for given transmitter power. Thus, the device whose design is described here should be broadly useful in military systems. Author (GRA)

N80-19438# Rockwell International Corp., Thousand Oaks, Calif. Electronics Rearch Center.
ION IMPLANTED GaAs INTEGRATED CIRCUIT PROCESS TECHNOLOGY Quarterly Technical Report, 1 Apr. - 30 Jun. 1979
F. H. Eisen and S. I. Long Aug. 1979 48 p refs
(Contract F49620-77-C-0087; ARPA Order 3384) (AD-A078958; SC5110.18QR; AFOSR-79-1268TR; QTR-8) Avail: NTIS HC A03/MF A01 CSCL 09/5

This report covers the third quarter, Phase 2 of a program on ion implanted planar GaAs integrated circuit technology. The overall objective of this program is the development of a manufacturable process for high-speed low-power GaAs logic circuits. The goal for Phase 1 was to establish the technology, and demonstrate its viability by fabricating circuits reaching MSI complexity. The goal for Phase 2 is to achieve the capability of fabricating GaAs ICs of LSI complexity. The program involves the Rockwell International Electronics Research Center and three subcontractors: Cal Tech, Cornell University and Crystal Specialties, Inc. The most important aspects of the work carried out in this quarter were the gaining of further insight into the causes for conversion of unqualified GaAs substrates, the fabrication of wafers with mask set AR3, and the preparation for evaluating the 3 x 3 parallel multiplier, a new circuit on AR3. This circuit will provide vital information for the design of the more complex circuits, on mask set AR4. GRA

N80-19439# Naval Surface Weapons Center, White Oak, Md. Underwater Systems Dept.
AN ACTIVE FILTER PRIMER Final Report
Arthur D. Delagrange 1 Mar. 1979 103 p refs
(W0476110) (AD-A078847; NSWC/TR-79-137) Avail: NTIS HC A06/MF A01 CSCL 09/5

This report gives the basics of active filter design, both theory and practice. It is based on a seminar given in the Signal Processing Branch of the Surface Antisubmarine Warfare Division. It will be of interest to persons working in the fields of analog filter design or signal processing. GRA

N80-19440# Harry Diamond Labs., Adelphi, Md.
A NEW APPROACH TO THE DESIGN OF HIGHLY EFFICIENT REGULATED dc-TO-dc CONVERTERS
Philip M. Cowett, Jr. Oct. 1979 17 p
(DA Proj. 1X3-23831-D-690; HDL Proj. 692764) (AD-A078627; HDL-TM-79-29) Avail: NTIS HC A02/MF A01 CSCL 09/5

This report describes a novel approach to the design of efficient switching regulated dc-to-dc converters whereby an energy storage inductor and a commutating diode are in the output transformer primary circuit of the converter. This design has advantages of simplicity, economy, reliability in applications where high-output voltages, multiple-output voltages, or both are involved. GRA

N80-19441# TRW Defense and Space Systems Group, Redondo Beach, Calif.
MONOLITHIC MICROWAVE PREAMPLIFIER Technical Report, 1 Apr. 1978 - 30 Jun. 1979
A. Benavides, R. Kaelberer, and K. Weller Sep. 1979 39 p refs
(Contract N00014-77-C-0645; RF5481001) (AD-A078522; TRW-251-028; TR-2) Avail: NTIS HC A03/MF A01 CSCL 09/5

During the initial phase of this contract, TRW developed a computer model for GaAs Microwave Field-Effect Transistors, in order to study the noise and gain properties of such devices for different channel doping densities and geometry configurations. This model has proven to be accurate when compared against measured results of noise figure, S parameters, and temperature effects on noise figure of FET devices. At the present, TRW has made use of this computer model in designing a low noise integrated preamplifier to operate at X-band. The theoretical design of this amplifier is the subject of the present report. GRA

N80-19442# Harvard Univ., Cambridge, Mass. Applied Sciences Div.
NONEQUILIBRIUM PHENOMENA IN SUPERCONDUCTING PHASE-SLIP CENTERS Interim Report
Alan M. Kadin Oct. 1979 226 p refs
(Contracts N00014-77-C-0085; N00014-75-C-0648; Grant NSF DMR-79-04155) (AD-A078441; TR-15) Avail: NTIS HC A11/MF A01 CSCL 20/3

This report presents the results of a study on the current-induced breakdown of superconductivity in a quasi-one-dimensional filament. This report has investigated the effects of a magnetic field H on nonequilibrium quasiparticle relaxation processes in superconductors by analyzing the I-V characteristics of long tin microbridges in a parallel field near T sub c(H). In the theoretical studies, using a generalized two-fluids picture to describe a quasi-one-dimensional superconductor near T sub c (for H equal 0), a heuristic derivation for a set of equations governing the temporal and spatial evolution of the charge imbalance (or branch imbalance) in the quasiparticles is provided. A novel consequence of the model is a prediction of intrinsic hysteresis in the dc current-voltage relation. The model also provides a convenient framework for dealing with ac effects in

PSC's, including resonance and synchronization in systems of closely-spaced PSC's and microbridges. GRA

N80-19443# Magnetic Corp. of America, Waltham, Mass.
MAGNETOHYDRODYNAMIC (MHD) MAGNET MODELING Interim Technical Report, Mar. - Sep. 1978
Z. J. J. Stekly, Robert D. Pillsbury, Jr., Alan R. Beckwith, and R. Doug Holmes Wright-Pattarson AFB, Ohio Jun. 1979 225 p Prepared in cooperation with General Dynamics Corp., San Diego, Calif.
(Contract F33615-77-C-3117; AF Proj. 3145)
(AD-A078865; MCA-WP13-01; AFAPL-TR-79-2045) Avail: NTIS HC A10/MF A01 CSCL 20/3

This report presents the results of a study to establish scaling criteria for a lightweight, superconducting magnet system for use in magnetohydrodynamic power generation. The scaling criteria are used to determine the appropriate size for a model magnet to be built to demonstrate the major system parameters of a full scale, 30 MWe, magnet system. GRA

N80-19444# Tennessee Univ., Knoxville. Dept. of Electrical Engineering
RESEARCH IN REMOTE SIGNAL TRANSMISSION ELECTRONICS
E. J. Kennedy, T. V. Blalock, J. Phelps, R. Rochelle, and F. Dyer 1 Oct. 1979 89 p ref
(Contract W-7405-eng-26)
(ORNL/Sub-7644/10; TR-EE/EL-10) Avail: NTIS HC A05/MF A01

Worst-case performance evaluation were made on an amplifier-discriminator circuit utilizing commercially available operational amplifier chips incorporated in a hybrid thick-film package, which is suitable for use to 250 C. Another hybrid thick film amplifier-discriminator system was developed and tested for use to 300 C. A dc-dc converter to supply +10v and -10v for amplifier power was designed, and evaluated up to an operating temperature of 300 C. Detailed design theory equations for high temperature dc-dc converters are presented. Significant problems with ceramic capacitors utilized at 300 C were found. DOE

N80-19445# Bendix Corp., Kansas City, Mo.
FIGURE-OF-MERIT FOR BARE AND COATED WIRES AND FLAT RIBBON JUMPERS
P. M. Heffley Nov. 1979 15 p
(Contract EY-76-C-04-0613)
(BDX-613-2304) Avail: NTIS HC A02/MF A01

A polymeric coating is proposed for use as a stiffener under high acceleration loads for wire and ribbon jumpers used in JMC's to bridge over circuitry. A dimensionless figure of merit is proposed for jumpers and bare and coated jumpers are compared via classical mathematical models and finite element model. Real production geometry, end attachment conditions, and acceleration direction factors are included in the finite element model. The results do not justify adding the coating. DOE

N80-19446# California Univ., Livermore. Lawrence Livermore Lab.
DETECTION OF A NORMAL ZONE IN INDUCTIVELY COUPLED SUPERCONDUCTING COILS
E. W. Owen Nov. 1979 23 p refs Presented at the Symp. on Eng. Probl. of Fusion Res., San Francisco, 13 Nov. 1979 Submitted for publication
(Contract W-7405-eng-48)
(UCRL-83307; CONF-791102-3) Avail: NTIS HC A02/MF A01

A method is described for the electrical detection of a normal zone in inductively coupled superconducting coils. Measurements are made with two kinds of bridges, mutual inductance bridges and self-inductance bridges. The bridge outputs are combined with other measured voltages to form a detector that can be realized with either analog circuits or a computer algorithm. The detection of a normal zone in a pair of coupled coils, each with taps, is discussed in detail. The method also applies to a pair of coils when one has no taps and to a pair when one coil is superconducting and the other is not. The method can be extended, in principle, to a number of coils. A description is given of a technique for balancing the bridges at near the operating currents of the coils. DOE

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

N80-19447*# National Aeronautics and Space Administration, Washington, D. C.
ATOMIZATION OF A LIQUID BY A SPRAY NOZZLE
S. S. Kutateladze, ed. Feb. 1980 279 p refs Transl. into ENGLISH of the book "Raspylivaniye Zhidkosti Forsunkami" Moscow-Leningrad, Izatelstvo Press, 1962, 265 p Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc. prep. by Gosuparstvennoye Energeticheskoye
(Contract NASw-3198)
(NASA-TM-75771) Avail: NTIS HC A13/MF A01 CSCL 20D

The theory of atomization by mechanical and pneumatic (or vapor) spray nozzles is discussed. Basic design recommendations resulting from generalization of the material and confirmed by experiments are given. Sprayers which are widely used in the furnaces of stationary steam boilers, the combustion chambers of gas turbines, and industrial furnaces are examined. J.M.S.

N80-19448*# DCW Industries, Studio City, Calif.
RECENT IMPROVEMENTS TO THE SPINNING BODY VERSION OF THE EDDYBL COMPUTER PROGRAM Interim Report
David C. Wilcox Nov. 1979 32 p refs
(Contract NAS2-10343)
(NASA-CR-152347; DCW-R-24-01) Avail: NTIS HC A03/MF A01 CSCL 20D

A conventional mixing length model specialized for thick boundary layers and a general model for pressure-strain correlation terms were added to the spinning version of EDDYBL. The models are discussed and modifications to the code input and output are presented. K.L.

N80-19449*# Illinois Univ., Chicago.
AN ANALYSIS OF TURBULENT DIFFUSION FLAME IN AXISYMMETRIC JET Final Report
Paul M. Chung and Kwan H. Im Apr. 1980 100 p refs
(Grant NsG-1150)
(NASA-CR-162884) Avail: NTIS HC A05/MF A01 CSCL 20D

The kinetic theory of turbulent flow was employed to study the mixing limited combustion of hydrogen in axisymmetric jets. The integro-differential equations in two spatial and three velocity coordinates describing the combustion were reduced to a set of hyperbolic partial differential equations in the two spatial coordinates by a binodal approximation. The MacCormick's finite difference method was then employed for solution. The flame length was longer than that predicted by the flame-sheet analysis, and was found to be in general agreement with a recent experimental result. Increase of the turbulence energy and scale resulted in an enhancement of the combustion rate and, hence, in a shorter flame length. Details of the numerical method as well as of the physical findings are discussed. R.C.T.

N80-19450*# FWG Associates, Inc., Tullahoma, Tenn.
MONODISPERSE ATOMIZERS FOR AGRICULTURAL AVIATION APPLICATIONS Final Report
Larry S. Christensen and Sidney L. Steely Feb. 1980 81 p refs
(Contract NAS3-21582)
(NASA-CR-159777) Avail: NTIS HC A05/MF A01 CSCL 20D

Conceptual designs of two monodisperse spray nozzles are described and the rationale used in each design is discussed. The nozzles were designed to eliminate present problems in

agricultural aviation applications, such as ineffective plant coverage, drift due to small droplets present in the spray being dispersed, and nonuniform swath coverages. Monodisperse atomization techniques are reviewed and a synopsis of the information obtained concerning agricultural aviation spray applications is presented. A.W.H.

N80-19451*# National Aeronautics and Space Administration, Washington, D. C.
MEMORY EFFECTS IN TURBULENCE
J. O. Hinze Nov. 1979 35 p refs Transl. into ENGLISH from Z. Angew. Math. Mech. (East Germany), v. 56, Oct. 1976 35 p Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75516) Avail: NTIS HC A03/MF A01 CSCL 20D

Experimental investigations of the wake flow of a hemisphere and cylinder show that such memory effects can be substantial and have a significant influence on momentum transport. Memory effects are described in terms of suitable memory functions. A.R.H.

N80-19452*# National Aeronautics and Space Administration, Washington, D. C.
CONVECTIVE FLOWS OF VISCOUS FLUID IN SPHERICAL LAYERS. CERTAIN ASTROPHYSICAL APPLICATIONS
I. M. Yavorskaya Mar. 1980 65 p refs Transl. into ENGLISH of "Konvektivnye Techeniya Vyazkoy Zhipdkosti V Sfericheskikh Sloykh. Nekotoryye Astrofizicheskiye Prilozheniya", Rept. Pr-346 Acad. of Sci. USSR, Inst. of Space Res., Moscow, 1977 p 1-64 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3198)
(NASA-TM-75923; Pr-346) Avail: NTIS HC A04/MF A01 CSCL 20D

The convective stability of a viscous liquid in spherical layers is investigated taking into consideration rotation, the latitudinal temperature gradient, and shear flow. The results of calculating nonlinear convective motion in spherical layers are examined. A discussion is given of the applicability of the results obtained to studying convection in astrophysical objects. M.G.

N80-19453*# National Aeronautics and Space Administration, Washington, D. C.
OUTLINE OF RESEARCH ON OSCILLATING BOUNDARY LAYERS
J. Cousteix Nov. 1979 51 p refs Transl. into ENGLISH of paper from Colloq. on Appl. Aerodyn. Presented at 15th Colloq. on Appl. Aerodyn., Marseille, 7-9 Nov. 1978 p 1-22 Original language document was announced as A79-32279 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75806) Avail: NTIS HC A04/MF A01 CSCL 20D

The state of the art in the field of unsteady boundary layers is outlined with emphasis on turbulent boundary layers. The unsteady flows considered are mainly periodic with the external velocity varying around a zero or nonzero mean time value. The principal results obtained on laminar boundary layers are also presented. K.L.

N80-19454*# Florida Univ., Gainesville. Dept. of Engineering Sciences.
VORTICITY ASSOCIATED WITH MULTIPLE JETS IN A CROSSFLOW
Susan Braden 25 Apr. 1980 39 p refs Presented at the AIAA Southeastern Regional Student Conf., Atlanta, 24-25 Apr. 1980
(Grant NsG-2288)
(NASA-CR-162855) Avail: NTIS HC A03/MF A01 CSCL 20D

Vortex patterns from multiple subsonic jets exiting perpendicularly through a flat plate into a subsonic crossflow were investigated. Tandem and transverse jet configurations were examined using a paddle wheel sensor to indicate the presence and relative magnitude of streamwise vorticity in the flow. Results are presented in the form of contour plots of rotational speed of the paddle wheel as measured in planes downstream from the jets and perpendicular to the crossflow. Well developed diffuse contrarotating vortices were observed for the configurations studied. The location and strength of these vortices depended on the multiple jet configuration and the distance downstream from the jets. K.L.

N80-19455# Ballistic Research Labs., Aberdeen Proving Ground, Md.
NAVIER-STOKES SOLUTIONS FOR SPIN-UP FROM REST IN A CYLINDRICAL CONTAINER Final Report
C. W. Kitchens, Jr. Sep. 1979 54 p refs
(DA Proj. 1L1-61102-AH-43; DA Proj. 1L1-6261B-AH-80)
(AD-A077115; AD-E430333; ARBRL-TR-02193) Avail: NTIS HC A04/MF A01 CSCL 20/4

An accurate and efficient predictor-corrector multiple-iteration scheme is adapted and used for the first time to solve the unsteady Navier-Stokes equations. Numerical solutions for Reynolds numbers up to 50,000 are obtained for the transient spin-up flow in a cylindrical container. The grid point distribution is optimized using coordinate transformations to simultaneously resolve details of both the interior and endwall/sidewall boundary layer flows formed during spin-up. Calculations for five test problems show consistency with previous computations and/or experimental measurements. Transient phenomena occurring at early time near the sidewall, including inertial oscillations and counter-rotating meridional flow, are reported and discussed. Computational experiments have been used to quantify the mass flow in the endwall boundary layers and investigate the compatibility condition used in Wedemeyer's spin-up model. GRA

N80-19456# Naval Ship Research and Development Center, Bethesda, Md.
AN EVALUATION OF THE TWO-PARAMETER MOMENTUM-INTEGRAL LAMINAR BOUNDARY LAYER CALCULATION METHOD OF HEAD Final Report
Christian H. VonKerczek and Nancy C. Groves Nov. 1979 57 p refs
(AD-A077325; DTNSRDC-79/019) Avail: NTIS HC A04/MF A01 CSCL 20/4

The two-parameter momentum-integral method of M.R. Head for the calculation of two-dimensional or axisymmetric, incompressible, laminar boundary layers is reworked into an analytical form, thereby eliminating the graphical data of Head's original method. The revised method is coded for digital computer solution and a number of test cases are computed. The numerical results for these test cases are compared with very accurate boundary layer solutions obtained by a finite-difference method and also results obtained using the Pohlhausen momentum-integral method. It was found that the Head method is vastly superior to the Pohlhausen method yet requires only about the same computational expense. Head's method yields very accurate results even for highly nonsimilar boundary layers. GRA

N80-19457# Polytechnic Inst. of New York, Farmingdale. Dept. of Mechanical and Aerospace Engineering.
NUMERICAL INTEGRATION OF COMPRESSIBLE, VISCOUS FLOW EQUATIONS Interim Report
Gino Moretti Sep. 1979 38 p refs
(Grant DAAG29-77-G-0072)
(AD-A077558; POLY-M/AE-79-40; ARO-14369.3-E) Avail: NTIS HC A03/MF A01 CSCL 20/4

A method for integrating the Navier-Stokes equations numerically is given, which takes the most advantage of the lambda-scheme for the integration of inviscid equations. Full details for supplementing the method (with the inclusion of imbedded shocks treatment) in two-dimensional unsteady flows are given. Results of one application are presented. GRA

N80-19458# California State Univ., Long Beach. Dept. of Mechanical Engineering.
THE CALCULATION OF MOMENTUM AND HEAT TRANSFER IN INTERNAL FLOWS AND IN FLOWS WITH SMALL REGIONS OF SEPARATION Final Technical Report, Jan. - Dec. 1978
Tuncer Cebeci Dec. 1978 71 p refs
(Contract N00014-77-C-0073)
(AD-A078484; ONR-CR-297-002-1) Avail: NTIS

HC A04/MF A01 CSCL 20/4

Numerical methods for solving boundary-layer equations are discussed and the application of the Box scheme to internal flows and to small regions of separated flow is decribed in detail. The Box scheme has previously been used with considerable success to solve a wide range of external two- and three-dimensional flows and is shown here to be equally successful when applied in internal and separated flows which require its use in an inverse manner. A nonlinear eigenvalue and a Mechul method are described: the former is simpler to use and is recommended for internal flow problems; the latter is more appropriate for calculations in and through small regions of separated flow. Turbulent flow is characterized by eddy-viscosity and eddy-conductivity assumptions which are shown to represent the mean-flow and heat-transfer properties, including transition, provided the location of the onset of transition is known. GRA

N80-19458# Naval Research Lab., Washington, D. C. Plasma Physics Div.

GAS CHANNEL FORMATION: DEPENDENCE OF HYDRODYNAMIC PHENOMENA ON THE INITIAL RADIAL PRESSURE PROFILE

Martin Lampe and Selig Kainer 30 Nov. 1979 27 p refs
(ARPA Order 3718; NRL Proj. R08-93)
(AD-A078917; NRL-MR-4129) Avail: NTIS HC A03/MF A01 CSCL 20/4

The hydrodynamic processes resulting from 'instantaneous' heating of a cylindrical region of gas are studied by means of numerical integration of the fluid equations. Various initial overpressures and radial profiles of initial pressure are considered. For very smooth radial profiles, e.g., the Bennett profile, the evolution is very simple: the gas expands radially, a single outgoing shock forms, the density at late times undershoots the value at pressure balance by only about 10% and then increases to pressure balance slowly, monotonically, and adiabatically. For profiles that are more square in shape, or are sharply discontinuous, the evolution is much more complicated. A strong rarefaction typically occurs, of brief duration and in a narrow region about the axis. During the rarefaction, both the density and temperature fall well below the values at pressure balance. The rarefaction is abruptly terminated by an inward-propagating shock, followed by multiple density oscillations, which can form shocks for strong overpressures. The dependence of the time scales and strengths of the rarefactions and shocks on the initial overpressure and profile shape are calculated and discussed. GRA

N80-19460# University of Southern California, Los Angeles. Dept. of Aerospace Engineering.

ON THE FEEDBACK PHENOMENON OF AN IMPINGING JET

Nagy Sabet M. Nosseir and Chih-Ming Hoh Sep. 1979 257 p refs
(Contract F49620-78-C-0060; AF Proj. 2307)
(AD-A078952; AFOSR-79-1263TR) Avail: NTIS HC A12/MF A01 CSCL 20/4

The resonance phenomenon which occurs when a high speed turbulent jet impinges on a large flat plate is experimentally studied. The far field noise is also investigated for a wide range of impinging jet speeds. The study involves far field, near field, and surface pressure measurements. A feedback of pressure waves between the nozzle and the plate is found to be the mechanism responsible for the resonance. The feedback loop is formed by downstream traveling large coherent structures, and upstream acoustic waves propagating in the nearby stagnant region around the jet. The upstream acoustic waves are generated by the impingement of large scale structures on the plate. Near the nozzle exit these waves are locked in-phase with the oscillations of the thin shear layer, which is forced to roll into large eddies at the resonance frequency f(r). Furthermore, the experimental data revealed the following interesting results: (1) The total period of the feedback loop is an integer N times the resonance period, N being constant over a resonance frequency stage. A jump from one frequency stage to another (occurring at certain nozzle-to-plate separation distances), takes place through a quantum unit change in N, so as to preserve the phase lock between the two oscillations at the nozzle. (2) As the wavy shear layer evolves into large vortices, a strong interaction develops among the initial instability vortices. This phenomenon is referred to as 'collective interaction', and is believed to be the mechanism responsible for the sharp drop in the passage frequency of the vortices near the nozzle exit. The frequency drops from the high instability frequency f(in) to that of the resonance frequency f sub r. GRA

N80-19461# Naval Surface Weapons Center, White Oak, Md. Strategic Systems Dept.

INFLUENCE OF ROUGHNESS AND BLOWING ON COMPRESSIBLE TURBULENT BOUNDARY LAYER FLOW Final Report

Robert L. P. Voisinet Jun. 1979 220 p refs
(AD-A077642; NSWC/TR-79-153) Avail: NTIS HC A10/MF A01 CSCL 20/4

The determination of the relative and combined effects of surface roughness and mass transfer on turbulent boundary-layer development, and in particular, on skin-friction drag was the prime objective of this study. Wind-tunnel tests were conducted in the NSWC Boundary-Layer Channel at a freestream Mach number of 2.9. The thick nozzle-wall boundary layer in the facility was subjected to a systematic variation of surface roughness and mass transfer conditions. Boundary-layer pressure and temperature surveys were obtained and skin friction was measured directly, using a skin-friction balance which had a provision for active blowing through the floating drag element. Data comparisons with skin-friction theories and law-of-the-wall velocity profile correlations are presented. GRA

N80-19462# General Atomic Co., San Diego, Calif.

TUBING FOR AUGMENTED HEAT TRANSFER Final Report

J. S. Yampolsky Jun. 1979 95 p refs
(Contract DEAC05-78OR-05761; GA Proj. 3257)
(GA-A-15442) Avail: NTIS HC A05/MF A01

The three areas of investigation covered are the manufacturing, the heat transfer-fluid flow performance, and the theoretical basis for the performance of spirally fluted tubes. The results of the investigation show that (1) the estimated price of spirally fluted tubing in quantity is equivalent to the cost of present commercially available welded tubing and is considerably lower than that of drawn tubing, and (2) spirally fluted tubing exhibits heat transfer-fluid flow performance advantages over conventional tubing which should lead to tubing cost savings of a factor of two over welded tubing and more for drawn tubing. This implies a lower cost for heat exchange equipment, since a significant part of the cost of this equipment is the cost of the tubing and the remainder of the cost is dependent on the amount of tubing. DOE

N80-19463# Los Alamos Scientific Lab., N. Mex.

STEADY-WAVE ANALYSIS OF THE EFFECT OF POROSITY ON VISCOUS AND INVISCID DETONATIONS BY USE OF A REACTIVE-POROUS ANALOG

R. L. Rabie Sep. 1979 29 p refs
(Contract W-7405-eng-36)
(LA-7819) Avail: NTIS HC A03/MF A01

A simple two-rate reactive material analog is used to determine reactive flow in a slightly porous medium. The rates govern the evolution of a chemical reaction coordinate and a solid volume coordinate, respectively. The rates are coupled so that mechanical phenomena can affect chemical phenomena and vice versa. Steady waves in both vicious and inviscid flow are examined, with variations in ignition criteria being of prime interest in the viscous flow. A particular result is that the steady state detonation velocity depends upon the ignition conditions. DOE

N80-19464# Oak Ridge National Lab., Tenn.

A COMPARISON OF THE RESULTS OF SEVERAL HEAT TRANSFER COMPUTER CODES WHEN APPLIED TO A HYPOTHETICAL NUCLEAR WASTE REPOSITORY

H. C. Claiborne, R. S. Wagner, and R. A. Just Dec. 1979 69 p refs
(Contract W-7405-eng-26)
(ORNL/TM-7112) Avail: NTIS HC A04/MF A01

A direct comparison of transient thermal calculations was made with the heat transfer codes HEATINGS, THAC-SIP-3D, ADINAT, SINDA, TRUMP, and TRANCO for a hypothetical nuclear waste repository. With the exception of TRUMP and SINDA the

codes agreed to within 5% for the temperature rises as a function of time. The TRUMP results agreed within 5% up to about 50 years, where the maximum temperature occurs, and then began an oscillary behavior with up to 25% deviations at longer times. The available version of SINDA was not compatible with the IBM compiler without an alternative method for handling a variable thermal conductivity. A programming error was discovered in the alternative method. Only HEATINGS, THAC-SIP-3D and ADINAT were used for the three-dimensional model calculations. The codes agreed within 5%; at distances of about 1 ft from the waste canister edge, temperature rises were also close to that predicted by the three-dimensional model. DOE

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N80-19465 British Broadcasting Corp., Kingswood (England). Research Dept.
COPAS: A HIGH SPEED REAL-TIME DIGITAL AUDIO PROCESSOR
G. W. McNally Nov. 1979 29 p refs
(BBC-RD-1979/26) Avail: BBC, Kingswood Warren, Tadsworth, Surrey, Engl.

The design principles for a digital processor operating on high quality digital audio signals are discussed. The processor's nomenclature is COPAS. The architectural features of COPAS are described including the choice of processor, the internal bus layout, the support processor, and the program sequencing. The programming of COPAS is described and a program example is presented. The performance of COPAS and its applications are discussed. A.W.H.

N80-19466 British Library Lending Div., Boston Spa (England).
A GAS-SENSITIVE SEMICONDUCTOR DIRECTOR FOR GAS-CHROMATOGRAPHIC ANALYSIS
Oct. 1979 19 p refs Transl. into ENGLISH from Huaxue Xuebao (Mainland China), v. 35, no. 3, 4, 1977 p 183-192
(BLL-RTS-11943) Avail: British Library Lending Div., Boston Spa, Engl.

The basic properties of a detector for gas chromatographic analysis made from an n-type semiconductor with tin oxide as its major component were examined. The sensitivity of the detector is shown to be of the same order as that of the flame ionization detector. The n-type semiconductor detector was used in the gas chromatographic analysis of: (1) trace amounts of hydrogen in rare gases; (2) samples of the transformer oil in a power station; (3) the amounts of atmospheric pollutants in workshops of an ethylene plant; and (4) samples collected during the processes of oil drilling. Results of these analyses and field tests indicate that this type of chromatography may become a simple, rugged, and practical instrument with high sensitivity. J.M.S.

N80-19467 British Library Lending Div., Boston Spa (England).
LASER VIBRATION GYROSCOPE
A. A. Golovan and A. V. Salmin Jul. 1979 8 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Priborostr. (USSR), v. 21, no. 1, 1978, p 58-62
(BLL-RTS-11579) Avail: British Library Lending Div., Boston Spa, Engl.

A laser vibration gyroscope is used as an example to consider whether the effct of parameter drift of the sensitive element on the accurate ascertainment of the absolute angular velocity is appreciably attenuated by modulation of the useful signal. A comparative analysis of the measuring conversion transconductance and signal to noise ratio of a vibration gyroscope using a ring laser and vibration gyroscope of oscillator type is presented. A.W.H.

N80-19468*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
HIGH TEMPERATURE PENETRATOR ASSEMBLY WITH BAYONET PLUG AND RAMP-ACTIVATED LOCK Patent Application
Kenneth E. Wood, inventor (to NASA) (Rockwell International, Downey, Calif.) Filed 7 Feb. 1980 14 p Sponsored by NASA
(NASA-Case-MSC-18526-1; US-Patent-Appl-SN-119335) Avail: NTIS HC A02/MF A01 CSCL 14B

A penetrator assembly adaptable to the very high temperature environment encountered in space vehicle atmospheric reentry is disclosed. Features of the assembly include a bayonet plug and a ramp activated lock, eliminating threaded surfaces which are subject to oxidation and subsequent failure. Columbium base metal with a silicide coating is used and provision is made for safety wiring of the ramping washers against unintended rotation in place. Application of the penetrator assembly to a high temperature, pressure probe, orifice installation for a space vehicle is illustrated. J.M.S.

N80-19469*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
THERMOCOUPLE, MULTIPLE JUNCTION REFERENCE OVEN Patent Application
Louis P. LeBlanc, inventor (to NASA) Filed 22 Feb. 1980 11 p
(NASA-Case-FRC-10112-1; US-Patent-Appl-SN-122985) Avail: NTIS HC A02/MF A01 CSCL 14B

An improved oven for maintaining the junctions of a plurality of reference thermocouples at a common and constant temperature is described. The oven is characterized by a cylindrical body defining a heat sink having an axially extended cylindrical cavity, a singularized heating element, an annular array of radially extended bores, and a temperature sensing device seated in the axial bore for detecting temperature changes as they occur in the spool and circuit. A diagram of the oven and thermocouples is presented and the design and applications of the invention are discussed. NASA

N80-19470# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
AN APPLICATION OF THE PHOTOMETRIC STEREO METHOD
Katsushi Ikeuchi and Berthold K. P. Horn Aug. 1979 30 p refs
(Contract N00014-77-C-0389)
(AD-A078125; AI-M-539) Avail: NTIS HC A03/MF A01 CSCL 20/6

The orientation of patches on the surface of an object can be determined from multiple images taken with different illumination, but from the same viewing position. This method, referred to as photometric stereo, can be implemented using table lookup based on numerical inversion of experimentally determined reflectance maps. Here we concentrate on objects with specularly reflecting surfaces, since these are of importance in industrial applications. Previous methods, intended for diffusely reflecting surfaces, employed point source illumination, which is quite unsuitable in this case. Instead, we use a distributed light source obtained by uneven illumination of a diffusely reflecting planar surface. Experimental results are shown to verify analytic expressions obtained for a method employing three light source distributions. GRA

N80-19471*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TEXTURE EXTRACTION ON THE ILLIAC 4 Final Report
Richard M. Brown and Marsha Jo Hannah 15 May 1979 40 p refs
(AD-A070523; NASA-TM-81002; IAC-TM-5768; IAC-Ref-77-15/1; ETL-0191) Avail: NTIS HC A03/MF A01 CSCL 14E

IAC has developed texture extraction programs that run on the ILLIAC IV parallel processor. It has used these programs to extract two different texture measures from 32 aerial images provided by ETL. These textures are based on the MAX-MIN technique on the computation of spatial dependence matrices. This report provides high-level descriptions of the texture

algorithms, the software system created to implement these algorithms, the test and verification efforts and the results and conclusions. GRA

N80-19472# Panametrics, Inc., Waltham, Mass.
DESIGN, CONSTRUCTION AND TESTING OF A MAGNETIC ELECTRON SPECTROMETER FOR DETECTING ELECTRONS TO 10 MeV, INCLUDING A PRELIMINARY DESIGN FOR A FLIGHT UNIT Final Report, Jun. 1977 - Sep. 1979
Frederick A. Hanser and Bach Sellers Sep. 1979 69 p refs
(Contract F19628-77-C 0180; AF Proj. 2311)
(AD-A078516; AFGL-TR-79-0229) Avail: NTIS HC A04/MF A01 CSCL 14/2

A magnetic electron spectrometer for electrons to 10 MeV energy has been designed, constructed, and tested. The magnet assembly uses rare-earth/cobalt magnets and achieves a gap field of 4 - 4.5 kG. The operation of the spectrometer was tested with beta sources and position sensitive detectors. It was found that a coincidence detector in the entrance collimator eliminates most of the bremsstahlung background. Some internal baffles are also necessary to reduce scattered electron background. The tests showed that a magnetic spectrometer which can analyze electrons to more than 10 MeV can be readily constructed. A preliminary design for a flight unit magnetic electron spectrometer is given. GRA

N80-19473# Northeastern Univ., Boston, Mass. Electronics Research Lab.
AN RF OSCILLATOR FOR ROCKET-BORNE AND BALLOON-BORNE QUADRUPOLE MASS SPECTROMETERS Interim Report
Thomas A. Palasek Sep. 1979 46 p refs
(Contracts F19628-78-C-0218; F19628-76-C-0256; AF Proj. 2310)
(AD-A078797; AFGL-TR-79-0226; SR-2) Avail: NTIS HC A03/MF A01 CSCL 14/2

This thesis deals with the development of a Radiofrequency (RF) Oscillator used in rocket-borne and balloon-borne quadrupole mass spectrometers. A new toroidal-shaped RF transformer has been developed along with new control circuitry for the modified Hartly oscillator that is used. Solutions to the problems of temperature stabilization and linearity are also discussed. Also included in this thesis is a review of quadrupole mass filter theory. GRA

N80-19474# General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
DEVELOPMENT OF PASSIVE HIGH PRESSURE GAUGES: FIELD EXPERIMENT Final Report, May 1978 - Jan. 1979
Jacques E. Schoutens, Craig C. Hudson, and Steven L. Senesac Jan. 1979 74 p refs
(Contract DNA001-78-C-0285)
(AD-A077194; AD-E300614; GE78TMP-102; DNA-4768F) Avail: NTIS HC A04/MF A01 CSCL 14/2

High pressure passive gauges capable of measuring peak shock pressures in the range of 2 to 25 kbar near detonating high explosives are being developed. The operation of these gauges is based upon the characteristics of second order transformations in pure metals or single crystals of alkaline halides and changes in the electrical characteristics of metal oxide varistors (MOV). This paper describes the results of an experiment in which three RbCl samples and four ZnO MOVs were placed against a 0.70 m thick concrete wall at the other side of which 2570 kg of explosives were detonated. The explosive and the concrete wall formed the driver end of a large shock tube. The tube and back of the wall were covered over with alluvium. At the gauge location, the alluvium depth was approximately 5 m. The samples were each located inside an individual pressure cell assembled into groups on steel plates to form gauges. The gauges were recovered some 2.5 m away from their original position. They had been translated and tumbled horizontally away from the burst point. The pressure cells were deformed and five out of seven samples were recovered--two MOVs and three RbCl. An examination of the RbCl samples indicated no phase change, meaning that the shock pressure appeared not to have reached the expected 12 kbar. The MOV samples were deformed, making the results of their reading of low confidence. Nevertheless, a tentative lower bound on the shock peak pressure can be placed at 9 kbar. The pressure cells suffered severe permanent deformation, leading to the conclusion that the dynamic stresses developed during their motion away from the burst point reached approximately 9 to 13 kbar. GRA

N80-19475# National Bureau of Standards, Washington, D.C. Fluid Engineering Div.
LOW VELOCITY PERFORMANCE OF A HIGH SPEED VANE ANEMOMETER Progress Report, 1 Jun. - 31 Jul. 1977
L. P. Purtell Sep. 1978 23 p refs
(Contract DI-BM-HO-166198)
(AD-A077457; NBSIR-78-1545) Avail: NTIS HC A02/MF A01 CSCL 20/4

Performance of a high speed vane anemometer is evaluated over the speed range of 43.4 to 741 feet per minute including starting speed and stopping speed. The tests were performed in the NBS Low Velocity Airflow Facility which provides a uniform flow of low turbulence and utilizes a laser velocimeter as the velocity standard. GRA

N80-19476# Mead Technology Labs., Dayton, Ohio.
COLOR INK-JET DEMONSTRATION PROGRAM Final Report
19 Sep. 1979 81 p refs
(Contract DAAK70-78-C-0229)
(AD-A075377; FR-79-4; ETL-0196) Avail: NTIS HC A05/MF A01 CSCL 14/5

A demonstration program was conducted to evaluate the use of ink-jet imaging technology for color map reproduction. A single-color laboratory copier was modified for three-color operation by adding two additional scan towers and ink-jet arrays. Extensive ink compatibility testing was performed to insure adequate operation with the system and the high wet strength map paper. The demonstration proved that the desired resolution and geometric fidelity could be obtained. Samples with 300 line-per-inch resolution were produced. True color balance could not be achieved within the funding and schedule constraints of the program, however, due to the breadboard nature of the device and the need for additional, individual channel controls and improved system reliability. GRA

N80-19477# Idaho National Engineering Lab., Idaho Falls.
THE 6-BEAM TEST, FOR GAMMA DENSITOMETER
R. R. Good 15 Aug. 1979 32 p refs
(Contract EY-76-C-07-1570)
(LTR-141-122) Avail: NTIS HC A03/MF A01

The results are presented of a test series designed to quantify the crosstalk between beams of a six-beam gamma densitometer data reduction program. DOE

N80-19478# Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
PULSE HEIGHT ANALYZER/OSCILLOSCOPE DISPLAY INTERFACE
W. J. Woodward, Jr. Oct. 1979 14 p refs
(Contract EY-76-C-09-0001)
(DP-1534) Avail: NTIS HC A02/MF A01

A portable interfacing instrument is described that accepts digital information from a pulse height analyzer and displays it as an energy spectrum on an ordinary laboratory oscilloscope. DOE

36 LASERS AND MASERS

Includes parametric amplifiers.

N80-19479 Duke Univ., Durham, N. C.
DEVELOPMENT OF A LASER-DOPPLER VELOCIMETER FOR USE IN THE AQUATIC ENVIRONMENT Ph.D. Thesis
John Robert Custer 1979 59 p
Avail: Univ. Microfilms Order No. 8002643

The development of a submersible laser Doppler velocimeter (LDV) for measuring turbulence in natural bodies of water is discussed. Comparison of the characteristics of currently used velocity transducers and those of an LDV current meter shows that the laser current meter represents a step in improving the

accuracy of velocity measurements in lakes, rivers, or the ocean. The restrictions which are imposed on such an instrument for the physics of laser velocimetry are described. The motion of typical oceanic particles is analyzed to determine whether or not they can follow the velocity fluctuations expected to be present in such flow. The results indicate that such particles can closely follow the motion of the fluid. The results include mean velocity profiles and mean-squared velocity fluctuation profiles taken in a tidal channel. Dissert. Abstr.

N80-19480*# Illinois Univ., Urbana. Gaseous Electronics Lab.
LASING CHARACTERISTICS OF GAS MIXTURES INVOLVING UFG: APPLICATION TO NUCLEAR PUMPING OF LASERS Final Report
J. T. Verdeyen and J. G. Eden 26 Mar. 1980 19 p refs
(Grant NsG-1609)
(NASA-CR-162618) Avail: NTIS HC A02/MF A01 CSCL 20E

Intense blue-green fluorescence from a structured band centered at lambda approximately 484 nm was observed from Ar, CF3I and NF3 gas mixtures excited by an electron beam. This emission was tentatively assigned to the E yields A transition of the iodine monofluoride (IF) molecule. The fluorescence efficiency of the IF(E yields A) band and the IF (E) state radiative lifetime were estimated to be approximately 6% and 15 ns, respectively. The emission band structure, the short IF(E) radiative lifetime and the Franck-Condon shift between the E and A states suggest that IF is an attractive candidate for a blue-green laser. R.E.S.

N80-19481# Materials Research Labs., Ascot Vale (Australia).
ERRORS IN THE MEASUREMENT OF ANGLE WITH A LASER INTERFEROMETER
Lilian M. Ramsay and David B. Prowse Apr. 1979 14 p ref
(AD-A078048; MRL-TN-420) Avail: NTIS HC A02/MF A01 CSCL 20/6

It is shown that when a laser interferometer is used for general angle measurement, including the calibration of angle measuring instruments such as rotary tables, errors of 30 inches or more can occur unless great care is taken in the optical alignment. On the other hand, if the instrument is carefully aligned, an accuracy of + or - 14 degrees occurs. The errors that occur are independent of the sensitivity of the interferometer system. GRA

N80-19482# Naval Research Lab., Washington, D. C.
THE THEORY OF FREE ELECTRON LASERS Interim Report
P. Sprangle and Robert A. Smith 18 Sep. 1979 29 p refs
(DARPA Order 3817)
(AD-A075363; NRL-MR-4033) Avail: NTIS HC A03/MF A01 CSCL 20/5

A general analysis is presented of free electron lasers in which a static periodic magnetic pump field is scatterd from a relativistic electron beam. The steady state formulation of the problem is fully relativistic and contains beam thermal effects. Growth rates associated with the radiation field, efficiencies, and saturated field amplitudes are derived for various modes of operation. Effects of space charge on the scattering process are included and shown to play a dominant role in certain situations. Scaling laws for the growth rates and efficiencies at a fixed radiation frequency as a function of the magnetic pump amplitude are obtained. The shear in beam axial velocity due to self fields is discussed and various methods of reducing it are suggested. Finally, a detailed illustration of a far infrared (lambda = 2mu m) two-stage free electron laser using a 3 MeV electron beam and a 2 cm wavelength magnetic pump field is presented. GRA

N80-19483# University of Southern California, Los Angeles.
INVESTIGATION OF SURFACE STABILIZED HIGH-PRESSURE GAS DISCHARGES Final Report, 22 May 1978 - 21 May 1979
Clad P. Christensen 20 Jun. 1979 24 p refs
(Contract N00173-78-C-0440)
(AD-A077040) Avail: NTIS HC A02/MF A01 CSCL 20/5

The research program described herein is an experimental investigation of problems associated with the production of stable, long-duration discharges in rare gas halogen mixtures. The work is oriented toward homogeneous, high-level excitation of small gas volumes (about 1 cu cm) with the ultimate goal being construction of a discharge-pumped rare gas halide laser which is capable of an output pulse duration greater than one microsecond. GRA

N80-19484# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
INJECTION LASER WAVEGUIDE COUPLER Final Report
R. R. Rice Jun. 1979 79 p refs
(Contract N00173-78-C-0087)
(AD-A077030) Avail: NTIS HC A05/MF A01 CSCL 20/6

The efficiency with which a double-heterostructure, GaAlAs laser diode can be edge-coupled to a Ti:LiNbO3 diffused waveguide has been studied using both theoretical and experimental approaches. Both the analytical and the numerical estimates of the coupling efficiency predict maximum efficiencies of approximately 50% for the laser diodes used in this program. Measurements of the sensitivity of the coupling efficiency to both transverse and longitudinal misalignment have been performed and these measurements show the coupling efficiency to be a slow function of the longitudinal separation and a strong function of the transverse offset. When the measured data are fit to an analytical model, the results indicate that a maximum coupling efficiency of about 50% has been achieved. Two coupler chips were fabricated and delivered to NRL. The coupler chips used a flip-chip design and were fabricated on silicon substrates. The units delivered to NRL had coupling efficiencies of 5% - 10% and thus fell short of the theoretically predicted efficiency. This result was due primarily to the stringent alignment tolerance imposed by the sensitivity of the coupling efficiency to transverse offset. GRA

N80-19485# Rockwell International Corp., Canoga Park, Calif. Rocketdyne Div.
CHEMICALLY PUMPED IODINE LASER Final Report
S. Hurlock, H. Laeger, and R. Wagner Kirtland AFB, N. Mex. AFWL Sep. 1979 230 p refs
(Contract F29601-78-C-0023; AF Proj. 3326)
(AD-A078919; AFWL-TR-79-52) Avail: NTIS HC A11/MF A01 CSCL 20/5

The production of O2(1 delta) by the reaction of chlorine fluorosulfate (CFS) vapor and chlorine gas with concentrated basic hydrogen peroxide solutions was studied under conditions of controlled contact area, contact time, and temperature. Variables were temperature, CFS and Cl(-2) flowrates, liquid flowrates, and liquid concentrations. Effluent flow, O(-2) flow, and O2(1 delta)/O2 were measured. O2(1 delta) yields with the CFS were lower than with Cl(-2) due to quenching. O(-2) production was about the same, governed primarily by contact time, liquid flow and temperature. Qualitative quenching experiments identified serious quenchers present in the CFS system. GRA

N80-19488# Army Electronics Research and Development Command, Fort Monmouth, N. J.
DEVELOPMENT OF THE NEODYMIUM PENTAPHOSPHATE (NPP) LASER Final Report
J. Gualtieri Oct. 1979 49 p refs
(DA Proj. 1T1-61102-AH-46)
(AD-A078603; DELNV-TR-79-5) Avail: NTIS HC A03/MF A01 CSCL 20/5

The structural properties of NPP are examined and the effect of twin domain boundaries on light propagation are discussed. Spectroscopic properties of NPP and other lanthanide pentaphosphates are outlined. The advantages of NPP as a laser material for miniature rangefinder and long distance fiber optic application are discussed. Laser and device considerations are reviewed and a miniature NPP laser cavity with all components individually removable for easy replacement (overall size 1.5 by 1.5 by 4.4 cm) are discussed. GRA

N80-19487# Illinois Univ. at Urbana-Champaign. Dept. of Aeronautical and Astronautical Engineering.
AN EFFICIENT ROTATIONAL NONEQUILIBRIUM MODEL OF A CW CHEMICAL LASER Final Report, 15 May 1978 - 14 May 1979

Lee H. Sentman and Warren Brandkamp Jul. 1979 113 p refs Prepared in cooperation with Textron Bell Aerospace, Buffalo, N.Y.
(Grant AF-AFOSR-3669-76; AF Proj. 2303)
(AD-A078485; AAE-TR-79-5; UILU-ENG-79-0505; AFOSR-79-1234TR) Avail: NTIS HC A06/MF A01 CSCL 20/5

An efficient rotational nonequilibrium model of a cw chemical laser was developed. The essential elements of the model and their influence on laser performance were shown by detailed comparison with a model which contains boundary layer flow striations, F atom wall recombination and detailed, finite rate kinetics (typically 21 species and 143 reactions). Rotational equilibrium and nonequilibrium species profiles, saturated gains, intensity distributions and power spectral distributions were compared for several cases. The rotational nonequilibrium model was coupled to a physical optics strip resonator code. GRA

N80-19488# Oak Ridge Associated Universities, Tenn.
PLANS FOR LASER HYPERFINE STRUCTURE MEASUREMENT AT UNISOR
H. K. Carter and C. R. Bingham 1979 6 p refs Presented at Intern. Symp. on Future Directions in Studies of Nuclei Far from Stability, Nashville, Tenn., 10 Sep. 1979
(Contract W-7405-eng-26)
(CONF-790976-1) Avail: NTIS HC A02/MF A01

The feasibility of optical spectroscopy experiments were studied in order to determine nuclear spins, moments, and changes in the root-mean-square charge radius. The technique is reviewed with the details for the experimental procedure described. The resolution and sensitivity expected is discussed. DOE

N80-19489# Oak Ridge Y-12 Plant, Tenn. Fabrication Systems Dept.
USE OF LASER INTERFEROMETER FOR POSITION FEEDBACK
W. E. Barkman Oct. 1979 19 p
(Contract W-7405-eng-26)
(Y-2188) Avail: NTIS HC A02/MF A01

Application of laser interferometer position-measuring systems to monitoring the position of machine tool slides is considered. It is indicated that the laser systems have an accuracy of + or - 0.5 parts/per/million and a maximum measuring velocity of 18m/min. The laser systems also permit the user to measure more directly the location of the point of interest. DOE

N80-19490# National Technical Information Service, Springfield, Va.
CARBON MONOXIDE LASERS. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Dec. 1979
Brian Carrigan Dec. 1979 228 p Supersedes NTIS/PS-76/0933; NTIS/PS-75/658; NTIS/PS-75/016;NTIS/PS-78 /1319; NTIS/PS-77/1107
(PB80-803133; NTIS/PS-78/1319; NTIS/PS-77/1107; NTIS/PS-76/0933; NTIS/PS-75/658; NTIS/PS-75/016) Avail: NTIS HC $30.00/MF $30.00 CSCL 20E

Gas discharge, gas dynamics electron beam, and infrared and chemical lasers involving carbon monoxide as a lasing medium are topics addressed. Molecular excitation, energy transfer, and reaction kinetics are discussed. Studies on laser pumping are included. This updated bibliography contains 221 abstracts, 11 of which are new entries to the previous edition. GRA

N80-19491# National Technical Information Service, Springfield, Va.
CARBON MONOXIDE LASERS, VOLUME 2. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1978 - Dec. 1979
Brian Carrigan Dec. 1979 149 p Supersedes NTIS/PS-78/1321; NTIS/PS-77/1108; NTIS/PS-76/0934
(PB80-803141; NTIS/PS-78/1321; NTIS/PS-77/1108; NTIS/PS-76/0934) Avail: NTIS HC $30.00/MF $30.00 CSCL 20E

Carbon monoxide lasers are discussed with topics on excitation, plasmas, development, molecular reactions, equipment, optics, transitions, and gas mixtures. Studies on optical pumping gas dynamics, chemical reactions, kinetics, and performance are covered. This updated bibliography contains 142 abstracts, 15 of which are new entries to the previous edition. GRA

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N80-19492 Illinois Univ. at Urbana-Champaign.
ENERGY CONSERVATION IN THE U.S. ECONOMY FROM INCREASED RECYCLE OF OBSOLETE STEEL SCRAP Ph.D. Thesis
James Ray Brodrick 1979 111 p
Avail: Univ. Microfilms Order No. 8004142

An energy model of the steel industry is formed from information on both the steel production technologies and the scrap recycle industry. The model is optimized by use of linear programming techniques to minimize the energy intensity of steel. The optimum point of obsolete scrap recycle is about six times the amount recycled in 1967 for a decrease of 8.5 percent in the existing energy intensity. With this amount of recycling, some scrap accumulated in disposal areas from previous years would have to be reclaimed. The scrap-intensive steelmaking processes, especially the all-scrap open hearth, increase their portion of the production, while the basic oxygen production decreases. The labor impact of this energy conservation measure is a tradeoff between the labor of the iron ore and coal mines to the labor of the scrap recycling insutry. As more scrap is recycled, the labor intensity of the steel producing system is increased. Dissert. Abstr.

N80-19493 Engineering Sciences Data Unit, London (England).
EQUILIBRIUM TEMPERATURES IN SELF-CONTAINED BEARING ASSEMBLIES. PART 5: EXAMPLES OF THE COMPLETE METHOD
1979 67 p
(ESDU-79002; ISSN-0141-2590; ISSN-0141-3996) For information on availability of series, sub-series, and other individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161. HC $770.50

Methods of estimating the temperature rise in a simple bearing assembly in order to assess the need for redesign or more refined analysis are presented. The bearing assemblies apply to all types of machinery from domestic appliances to spacecraft mechanisms. The developed analyses refer to simple bearing assemblies in which there is no separate, external, cooling system. It is applicable also to the estimation of temperatures at localized heat sources of moderate intensity in other types of assembly having a high degree of cylindrical symmetry. ESDU

N80-19494 British Library Lending Div., Boston Spa (England).
EXPERIMENTAL INVESTIGATION INTO THE HEAT FLUX IN THE PISTON AND CYLINDER LINER OF A HIGH-SPEED DIESEL ENGINE
Gerhard Woschni Oct. 1979 19 p refs Transl. into ENGLISH from MTZ Motortech. Z. (West Germany), v. 39, 1978 p 12 (BLL-RTS-11902) Avail: British Library Lending Div., Boston Spa, Engl.

The heat transfer in a high speed diesel engine with external supercharging was investigated. The heat balance, the measured temperature distributions, and the measured time variable surface temperatures were evaluated in order to separately determine the heat transmitted to the component pistons, cylinder head, and cylinder liner. A.W.H.

N80-19495*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.
DAMPING IN TAPERED ANNULAR SEALS FOR AN INCOMPRESSIBLE FLUID
David P. Fleming Apr. 1980 22 p refs
(NASA-TP-1646; E-124) *Avail: NTIS HC A02/MF A01 CSCL 11A

Damping in annular seals is calculated for an incompressible fluid. Results show that damping in tapered seals optimized for stiffness is considerably less than that in straight seals for the same minimum clearance. Damping in rotating seals can promote

fractional frequency whirl. Neglecting fluid acceleration makes solution much easier, but leads to errors in calculated damping of up to 16 percent. K.L.

N80-19498*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CALCULATED AND EXPERIMENTAL DATA FOR A 118-mm BORE ROLLER BEARING TO 3 MILLION DN
Harold H. Coe and Frederick T. Schuller 1980 37 p refs Proposed for presentation at Intern. Lubrication Conf., San Francisco, 18-21 Aug. 1980; sponsored by ASME and the Am. Soc. of Lubrication Engr.
(NASA-TM-81427; E-063) Avail: NTIS HC A03/MF A01 CSCL 13I

The operating characteristics for 118 mm bore cylindrical roller bearing are examined using the computer program CYBEAN. The predicted results of inner and outer-race temperatures and heat transferred to the lubricant generally compared well with experimental data for shaft speeds to 3 million DN (25,000 rpm), radial loads to 8900 N (2000 lb), and total lubricant flow rates to 0.0102 cu m/min (2.7 gal/min). M.G.

N80-19497*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FERROGRAPHIC AND SPECTROGRAPHIC ANALYSIS OF OIL SAMPLED BEFORE AND AFTER FAILURE OF A JET ENGINE
William R. Jones, Jr. Feb. 1980 20 p refs
(NASA-TM-81430; E-353) Avail: NTIS HC A02/MF A01 CSCL 21E

An experimental gas turbine engine was destroyed as a result of the combustion of its titanium components. Several engine oil samples (before and after the failure) were analyzed with a Ferrograph as well as plasma, atomic absorption, and emission spectrometers. The analyses indicated that a lubrication system failure was not a causative factor in the engine failure. Neither an abnormal wear mechanism, nor a high level of wear debris was detected in the oil sample from the engine just prior to the test in which the failure occurred. However, low concentrations of titanium were evident in this sample and samples taken earlier. After the failure, higher titanium concentrations were detected in oil samples taken from different engine locations. Ferrographic analysis indicated that most of the titanium was contained in spherical metallic debris after the failure. K.L.

N80-19498*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
IDEAL SPIRAL BEVEL GEARS: A NEW APPROACH TO SURFACE GEOMETRY
R. L. Huston (Cincinnati Univ., Ohio) and J. J. Coy 1980 22 p refs Proposed for presentation at 3d Intern. Power Transmission and Gearing Conf., San Francisco, 18-22 Aug. 1980; sponsored by ASME
(NASA-TM-81446; E-366; AVRADCOM-TR-80-C-5) Avail: NTIS HC A02/MF A01 CSCL 13I

The fundamental geometrical characteristics of spiral bevel gear tooth surfaces are discussed. The parametric representation of an ideal spiral bevel tooth is developed based on the elements of involute geometry, differential geometry, and fundamental gearing kinematics. A foundation is provided for the study of nonideal gears and the effects of deviations from ideal geometry on the contact stresses, lubrication, wear, fatigue life, and gearing kinematics. M.G.

N80-19499*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ON THE CHARACTERISTICS OF CENTRIFUGAL-RECIPROCATING MACHINES
W. H. Higa 1 Feb. 1980 28 p
(Contract NAS7-100)
(NASA-CR-162881; JPL-Pub-79-108) Avail: NTIS HC A03/MF A01 CSCL 13I

A method of compressing helium gas for cryogenic coolers is presented which uses centrifugal force to reduce the forces on the connecting rod and crankshaft in the usual reciprocating compressor. This is achieved by rotating the piston-cylinder assembly at a speed sufficient for the centrifugal force on the piston to overcome the compressional force due to the working fluid. The rotating assembly is dynamically braked in order to recharge the working space with fluid. The intake stroke consists of decelerating the rotating piston-cylinder assembly and the exhaust stroke consists of accelerating the assembly. K.L.

N80-19500# Army Materials and Mechanics Research Center, Watertown, Mass.
CHARACTERISTICS OF MECHANICALLY FASTENED JOINTS OF CIP/HIP-1 BERYLLIUM Final Report
Shun-Chin Chou and James H. Rainey Aug. 1979 37 p
(DA Proj. 8X3-63304-D-215)
(AD-A078275; AMMRC-TR-79-48) Avail: NTIS HC A03/MF A01 CSCL 13/5

Mechanically fastened joints of CIP/HIP-1 beryllium were investigated. A standard ASTM pin-jointed bearing strength test was used to determine the effect of hole size and edge distance-to-thickness ratios on the bearing strength of beryllium plates. Joints for structures were studied by testing two types of arrangements of pin holes with different transverse pitches. From the standard ASTM pin-jointed bearing strength tests, it was determined that the design criterion for single-pinned joints of CIP/HIP-1 beryllium should be based on maximum stress instead of net cross-section stress. Furthermore, it was found that if the edge distance-to-pin diameter ratio was kept constant, the specimens would have the same bearing yield stress, bearing strength, and maximum bearing strain. In the investigation of structural bolted joints, the double-bolted joints show that the transverse pitch and hole pattern have no effect on the load-carrying capability. GRA

N80-19501# Westinghouse Research and Development Center, Pittsburgh, Pa.
INVESTIGATION OF WELD POOL STRUCTURE AND PROPERTY CONTROL IN PULSED ARC WELDING Annual Progress Report, 15 Sep. 1978 - 14 Sep. 1979
G. M. Ecer, G. G. Lessman, and H. D. Brody 9 Nov. 1979 57 p refs Prepared in cooperation with Pittsburg Univ., Pa.
(Contract N00014-77-C-0596)
(AD-A078222; Rept-79-9D4-PULSE-R1) Avail: NTIS HC A04/MF A01 CSCL 13/8

Full penetration pulsed current gas tungsten arc welds on Fe-26Ni alloy sheets were dimensionally and structurally analyzed. Weld pool kinetics and weld surface ripple formation were studied using high speed motion pictures, conventional and scanning electron metallography, and x-ray dispersive analysis. The two dimensional heat flow computer model developed during the last year was modified to reflect more realistic convective flow in the weld pool, anode size and atmospheric heat loss. Work on thick plate welds and the computational model for 3D heat flow and solute segregation under pulsing were initiated. Some degree of structural control in the weld fusion zone of full penetration welds was found to be feasible. A mechanism for the formation of weld surface ripples and a technique of estimating local solid growth rates from the ripples were proposed. GRA

N80-19502# United Technologies Research Center, East Hartford, Conn.
MODELING OF THE HOT ISOSTATIC PRESSING PROCESS Interim Report, 15 Jul. 1978 - 14 Jul. 1979
Brice N. Cassenti and K. J. Cheverton Sep. 1979 133 p refs
(Contract F49620-78-C-0090; AF Proj. 2307)
(AD-A078162; AFOSR-79-1236TR) Avail: NTIS HC A07/MF A01 CSCL 13/8

This report describes the first year of progress of a two year investigation to develop a modeling strategy to predict the final shape of components manufactured by the Hot Isostatic Pressing (HIP) process. When a powder metal is subjected to the high pressures at high temperatures there is a permanent reduction in the macroscopic volume by approximately 30 percent. The volume reduction, which is not included in classical creep and plasticity theories, necessitates the modification of the classical theories. The major part of this report concerns the development of a constitutive model for powder metals. A model for powder metals subjected to an external hydrostatic pressure has been developed and compares well with experimental results. The exact form of the theory depends on the results of mechanical tests presently being performed. The constitutive model is being incorporated into the MARC Analysis Research Corporation

(MARC) nonlinear finite element computer program and experiments analysis using the modified code will be performed to verify the accuracy of the theory. Once the theory has been verified it will be applied to the HIP of a disk where a sensitivity study will determine an efficient modeling strategy. The results and future plans of the program are discussed in detail. GRA

N80-19503# Naval Postgraduate School, Monterey, Calif.
WASTE HEAT RECOVERY UNIT DESIGN FOR GAS TURBINE PROPULSION SYSTEMS M.S. Thesis
Robert Meredith Combs Sep. 1979 301 p refs
(AD-A078154) Avail: NTIS HC A14/MF A01 CSCL 13/10

A design model for a once-through waste heat recovery unit with a segmented fin-tube arrangement was developed along with a simple model of a combined gas and steam (COGAS) turbine propulsion system. These models were integrated and applied in a computer program written in FORTRAN IV for the IBM 360-67 computer. Waste heat recovery unit designs were produced and tested at off-design conditions. Using the space constraints and power requirements of a Navy destroyer-type ship, one design was selected and employed to make estimates of possible fuel savings to be realized through the application of a COGAS system. GRA

N80-19504# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
EVALUATION OF DYNAMICALLY RIVETED JOINTS Final Report, 1 Oct. 1977 - 30 Sep. 1978
Basil P. Leftheris, H. Eidinoff, and R. E. Hooson Jul. 1979 71 p refs
(Contract N62269-77-C-0478; WF41400000)
(AD-A077223; RE-587; NADC-77202-30) Avail: NTIS HC A04/MF A01 CSCL 13/5

The performance of stress wave driven rivet installations is evaluated in terms of crack growth arresting capability, using precracked specimens subjected to constant amplitude and spectrum fatigue loading. Rivets installed in precracked holes using the Grumman Stress Wave Riveter SWR are shown to be effective in arresting crack growth. Residual stresses resulting from rivet coldwork are determined and the effective stress intensity factor K sub I is calculated. It is concluded that stress wave rivet installations offer significant potential weight saving for structures designed to a damage tolerant criteria. GRA

N80-19505# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
TRANSIENT THERMAL EFFECTS IN DISC BRAKES Final Report, Aug. 1977 - Jul. 1979
Ben J. Brookman, Jr. Nov. 1979 464 p refs
(AF Proj. 2402)
(AD-A078735; AFFDL-TR-79-3112) Avail: NTIS HC A20/MF A01 CSCL 13/6

An investigation was undertaken with the ultimate objective being to develop a general theoretical model for predicting temperatures within the stators, rotors, rim, torque tube, tire, fuse plug and bead seat of a typical disc brake assembly. The effort was divided into four phases: (1) Temperature Measurement Analysis, (2) Theoretical Analysis of Brake and Component Parts, (3) Full Scale Brake Tests, and (4) Correlation of results. GRA

N80-19506# Naval Ship Research and Development Center, Bethesda, Md.
ICE SEAL FOR ROTATING SHAFTS
Alfred B. Harbage, Jr. Oct. 1979 35 p
(ZR0220601)
(AD-A076308; DTNSRDC-79/085) Avail: NTIS HC A03/MF A01 CSCL 11/1

A sealing device utilizing water ice to form a very close-fitting liquid water capillary seal about a rotating shaft has been designed, built, and tested. The experimental shaft diameter was 6 in. (15.24 cm) and it rotated at 600 rpm. The observed leakage rates were below 0.05 cu in/sec (0.8 cu cm/s) for differential pressures up to 600 psi (4150 kPa). The maximum power required to drive the shaft was less than 500 W. A set of basic equations was developed to predict the seal performance. Experimental results indicate the basic equations are sufficiently accurate for future seal designs. GRA

N80-19507# State Univ. of New York at Buffalo.
GLOBAL BOUNDS AND APPROXIMATIONS FOR NONLINEAR DIFFUSION PROBLEMS Final Report
Paul William Davis 14 Sep. 1979 8 p refs Prepared in cooperation with Worcester Polytechnic Inst., Mass.
(Grant DAAG29-78-G-0239)
(AD-A076343; ARO-14245.5-M) Avail: NTIS HC A02/MF A01 CSCL 12/1

This final report briefly summarizes the development and application of approximation and bounding techniques to nonlinear diffusion equations modelling phenomena in lubrication theory, combustion theory, heat flow, etc. The development of mathematical techniques has been guided by the need to meet physical problems. The mathematical techniques have been used to illuminate the behavior of models of various nonlinear diffusion phenomena. Techniques include monotone approximation schemes and nonlinear comparison theorems. These permit, for example, deriving bounds on solutions of nonlinear diffusion equations by finding functions which satisfy appropriate sets of differential inequalities. A typical application of these techniques has been the exploration of the relation between the stationary approximation of combustion theory and the full, time-dependent model. GRA

N80-19508# Battelle Columbus Labs., Ohio.
HYDROGEN IN HY-130 WELD METAL Final Report, Jul. 1977 - Dec. 1978
Michael D. Hayes and Daniel Hauser May 1979 55 p refs
(Contract N00014-74-C-0407)
(AD-A077574) Avail: NTIS HC A04/MF A01 CSCL 11/6

This is the final report on a program designed to evaluate the potential for using rare-earth materials to getter hydrogen during welding. The end objective was to reduce the potential for hydrogen embrittlement in HY-130 steel welds. This report briefly summarizes work conducted during the first three years of the program, during which time several varieties of rare-earth containing-electrodes were produced. Cracking problems during drawing were encountered when rare-earth materials were added to high-strength filler wires. A method of addition was found wherein rare-earth silicon and rare-earth nickel compounds were incorporated into a rare-earth cored wire. This wire was then used as a cold-wire addition and weldments were produced by the gas metal-arc process. However, impact properties of these welds were below specified limits. This was partially attributed to the poor welding performance resulting from the rare-earth additions. Increased arc instability resulted in spatter, bead irregularity, and poor wetting action. Weldability improved when argon-O2 mixtures were used but the oxygen addition to the shielding gas oxidized all of the rare earths. GRA

N80-19509# SKF Industries, Inc., King of Prussia, Pa.
ESTABLISHMENT OF ENGINEERING DESIGN DATA FOR HYBRID STEEL/CERAMIC BALL BEARINGS Final Report, Apr. 1978 - Aug. 1979
F. R. Morrison, J. Pirvics, and T. Jonushonis Sep. 1979 63 p refs
(Contract N00019-78-C-0304)
(AD-A078934; SKF-AL79T033) Avail: NTIS HC A04/MF A01 CSCL 11/6

A hybrid steel/ceramic angular contact ball bearing was designed for optimum performance at 2.5 x 10 to the 6th power DN. A lot of bearings was fabricated to this design and life tests were conducted under two different loads. A detailed failure anlaysis was completed to define the causes for the premature silicon nitride ball failures. GRA

N80-19510# Department of Energy, Washington, D. C. Office of Technology Impacts.
ISSUES CONCERNING THE LIGHT-DUTY DIESEL
Sep. 1979 145 p refs
(DOE/EV-0050/1) Avail: NTIS HC A07/MF A01

Major issues in diesel-related policy considerations are discussed. The issues are summarized in three areas: health and environmental protection, fuel conservation, and economic and programmatic trade-offs. K.L.

N80-19511# National Technical Information Service, Springfield, Va.

THRUST, SLEEVE AND JEWEL BEARINGS, VOLUME 2. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1974 - Nov. 1979
Guy E. Habercom, Jr. Dec. 1979 277 p Supersedes NTIS/PS-78/1287; NTIS/PS-77/1135 and NTIS/PS-76/0955 2 Vol.
(PB80-802630; NTIS/PS-78/1287; NTIS/PS-77/1135; NTIS/PS-76/0955) Avail: NTIS HC $30.00/MF $30.00 CSCL 13I

Design, mechanical properties, and performance of thrust, sleeve, and jewel bearings are reported. Lubricantion effects, torque effects, bearing hydrodynamics, and bearing physical properties are topics addressed. This updated bibliography contains 270 abstracts, 45 of which are new entries to the previous edition. GRA

N80-19512# National Technical Information Service, Springfield, Va.
THRUST, SLEEVE AND JEWEL BEARINGS. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Nov. 1979
Guy E. Habercom, Jr. Dec. 1979 137 p Supersedes NTIS/PS-78/1286; NTIS/PS-77/1134; NTIS/PS-76/0953 and NTIS/PS-75/802 2 Vol.
(PB80-802622; NTIS/PS-78/1286; NTIS/PS-77/1134; NTIS/PS-76/0953; NTIS/PS-75/802) Avail: NTIS HC $30.00/MF $30.00 CSCL 13I

Design and performance of thrust, sleeve, and jewel bearings are reviewed. Lubrication effects, torque effects, bearing hydrodynamics, and bearing physical properties are among the parameters investgated. This updated bibliography contains 134 abstracts, 3 of which are new entries to the previous edition. GRA

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N80-19513 Pittsburgh Univ., Pa.
MULTISTATE RELIABILITY MODELS AND SOME EXTENSIONS OF A UNIVARIATE SHOCK MODEL Ph.D. Thesis
William S. Griffith 1979 72 p
Avail: Univ. Microfilms Order No. 8004860

Axioms which may be used to define multistate coherent systems are examined. After obtaining some structural properties of such systems, their stochastic performance is modeled by using an expected utility function. Then an analogue of the Birnbaum reliability importance is developed, its properties discussed and some examples considered. Finally, a bivariate shock model which is used to unify various bivariate exponential distributions is considered. A number of results dealing with discrete NBU properties being transformed into continuous NBU properties in the bivariate setting are obtained. Dissert. Abstr.

N80-19514 British Library Lending Div., Boston Spa (England).
TESTING THE CONTACT CHARACTERISTICS OF ELECTRODEPOSITED COATINGS, PART 1
K.-L. Schiff and R. Schnabl Oct. 1979 29 p refs Transl. into ENGLISH from Metalloberflaeche (West Germany), v. 32, no. 10, 1978 p 423-429
(BLL-RTS-11808) Avail: British Library Lending Div., Boston Spa, Engl.

The requirements of electrical contacts are reviewed. Accelerated methods for corrosion testing contact materials and for the analytical examination of precious metal surfaces are presented with emphasis on contact resistance, electrical wear, ductility, and mechanical wear. Examples are included. A.R.H.

N80-19515*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LIFE SCIENCES FLIGHT EXPERIMENTS PROGRAM. LIFE SCIENCES PROJECT DIVISION, PROCUREMENT QUALITY PROVISIONS
Gordon House Jan. 1980 18 p
(NASA-TM-80962; JSC-16427) Avail: NTIS HC A02/MF A01 CSCL 14D

Methods are defined for implementing quality assurance policy and requirements for life sciences laboratory equipment, experimental hardware, integration and test support equipment, and integrated payloads. K.L.

N80-19516# Stanford Univ., Calif.
ACOUSTIC MICROSCOPY FOR NONDESTRUCTIVE EVALUATION OF MATERIALS Semiannual Technical Report, 1 Feb. - 31 Jul. 1979
C. F. Quate 1979 85 p refs
(Contract F49620-78-C-0098; ARPA Order 3569; AF Proj. 2306)
(AD-A078088; SU-GL-3023; AFOSR-79-1259TR) Avail: NTIS HC A05/MF A01 CSCL 17/1

Research in the field of acoustic microscopy is described for the first half of 1979. The properties and design of the acoustic transducer lens combination is detailed. The source of contact in the acoustic images for both material surfaces and integrated circuits is discussed with the view of determining how small changes in surface elastic properties alter the reflectivity for a spherically converging beam. The use of liquid gallium in the lens is described. Some of the work on the photoacoustic microscope is included. GRA

N80-19517# Stanford Univ., Calif.
RESEARCH ON NONDESTRUCTIVE TESTING Final Report, 1 Sep. 1978 - 31 Aug. 1979
G. S. Kino Oct. 1979 51 p refs
(Grant AF-AFOSR-3726-78)
(AD-A078483; SU-GL-3049; AFOSR-79-1261TR) Avail: NTIS HC A04/MF A01 CSCL 14/2

The aim of this year's work has been to establish new techniques for measuring the properties of materials with the ultimate aim of determining material properties such as hardness and yield strength and being able to predict the life and servicibility of mechanical structures. We have limited ourselves to acoustic measurement techniques. Our purpose is to correlate the results of acoustic measurements with the mechanical properties of the material of interest. The project has been divided into two parts: (1) the characterization of microstructure by acoustic NDE, and (2) the measurement of stress states by acoustic NDE. GRA

N80-19518# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
EVALUATION OF AND RECOMMENDED CHANGE TO THE RELIABILITY IMPROVEMENT WARRANTY (RIW) GUIDELINES M.S. Thesis
Mark C. Jacobson and Reagan L. Skaggs Sep. 1979 101 p refs
(AD-A077672; AFIT-LSSR-23-79B) Avail: NTIS HC A06/MF A01 CSCL 14/4

The reliability improvement warranty is a relatively new acquisition technique in government contracting. To encourage effective use of the technique, HQ USAF Directorate of Procurement Policy (LGP) published the pamphlet entitled Interim Guidelines Reliability Improvement Warranty (RIW) in July, 1974. This pamphlet provided guidance in the areas of application criteria, funding, provisions, determination of cost effectiveness, and general implementation and administrative information. Since the guidelines had not been revised since publication, the researchers' objectives were to determine if the guidelines were adequate and to obtain recommendations for improving those guidelines, if necessary. To meet those objectives, 24 individuals knowledgeable in the area of RIW were interviewed. Their perceptions were gathered through ten scaled response questions that addressed main areas within the guidelines. The distribution of responses were tested via the Kolmogorov-Smirnov two sample test to determine the adequacy of the area. Interviewees also recommended changes to correct perceived problem areas via open ended response questions. The researchers concluded the guidelines were inadequate in a number of areas, e.g., evaluation of candidates, example clauses, administrative concerns and cost-benefit analysis among others. Suggestions for increased detail, more examples, deeper rationale and organization into a regulation were made. GRA

N80-19519# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
AVIONICS RELIABILITY, ITS TECHNIQUES AND RELATED DISCIPLINES
Manfred C. Jacobson (AeG-Telefunken, Ulm, West Germany) Oct. 1979 536 p refs In ENGLISH and FRENCH Conf. held in Ankara, 9-13 Apr. 1979
(AGARD-CP-261; ISBN-92-835-0254-X Avail: NTIS HC A23/MF A01

A state of the art review of topics related to reliability and logistics in avionics systems is given. General concepts, reliability/availability requirements and demonstration, reliability and maintainability practices and effects in avionics design, development and production, software reliability, and logistics support aspects are among the topics discussed. For individual titles, see N80-19520 through N80-19561.

N80-19520# Naval Postgraduate School, Monterey, Calif.
AN ANALYSIS OF THE EVOLUTION OF THE RELIABILITY AND MAINTAINABILITY DISCIPLINES
M. B. Kline, J. Di Pasquale, T. A. Hamilton, and R. L. Masten *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 24 p Prepared in cooperation with Naval Weapons Center (For primary document see N80-19519 10-38)
Avail: NTIS HC A23/MF A01

The results of a study of the development of the reliability and maintainability (R&M) disciplines are presented. The exponential rate of growth shown during this period is an indication of the dynamic nature and importance of these disciplines to system development, design, and operation. Family trees of each discipline developed to indicate the growth and branching of the relevant subject matter are presented. The direction and rate of growth of these disciplines in each of the decades of interest are analyzed along with projections of current and future trends. Applications of R&M in both the private and public sectors, including defense, space, energy, transportation, industrial and consumer items, are examined. J.M.S.

N80-19521# Royal Signals and Radar Establishment, Malvern (England).
DIFFICULTIES IN PREDICTING AVIONICS RELIABILITY
J. E. Green *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 7 p refs (For primary document see N80-19519 10-38)
Avail: NTIS HC A23/MF A01

Avionics reliability prediction techniques are considered with particular attention given to factors which significantly influence reliability. These include types of aircraft, the duration and type of sortie, the frequency of use, and the incidence of reported but unconfirmed failures which nevertheless result in maintenance actions. It is shown that failures are nonexponentially distributed during a sortie, although conventional predictions are based on the exponential distribution. Therefore, various proposals for predicting avionics reliability are presented to overcome this discrepancy. The difficulties in making predictions for the latest microelectronic devices are considered with reference to MIL-HDBK-21 B and emphasis on the potential reliability of LSI and microprocessors. The significance of the choice of quality factors is noted. J.M.S.

N80-19522# Naval Postgraduate School, Monterey, Calif.
RELIABILITY GROWTH MODELS
W. M. Woods *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 21 p refs (For primary document see N80-19519 10-38)
Avail: NTIS HC A23/MF A01

The concept of reliability growth models is introduced. Two reliability growth models are presented, one for time data and one for attributes data. Their uses are discussed and the methods for evaluating them are presented in graphical and tabular form. Both models show reasonable accuracy for reasonable amounts of testing under a wide variety of actual reliability growth and nongrowth. J.M.S.

N80-19523# Elektronik-System G.m.b.H., Munich (West Germany).
A SIMULATION PROGRAM FOR THE DETERMINATION OF SYSTEM RELIABILITY OF COMPLEX AVIONIC SYSTEMS
Christian Krause and Hubert Limbrunner *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 9 p ref (For primary document see N80-19519 10-38)
Avail: NTIS HC A23/MF A01

The simulation program SIMZUV which computes system reliability according to the Monte Carlo method is described. This program enables the realistic consideration of complex failure logics of meshed systems, couplings of failures of different units and different mission phases, which is possible by the selection of a certain formulation of these marginal conditions. In its capacity as a simulation program, SIMZUV is capable of considering condition and time dependent failure rates and various unit reliability functions. It is shown that it is possible to perform the simulation of a substitute system of higher failure rates with short computer time, after a transformation of the failure rates. It is demonstrated that the reliability curve of the actual system can be computed from the reliability curve of the substitute system via a linear system of equations.

N80-19524# British Aerospace Dynamics Group, Stevenage (England).
MICRO-ELECTRONIC SYSTEMS RELIABILITY PREDICTION
P. D. T. OConnor *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 9 p refs (For primary document see N80-19519 10-38)
Avail: NTIS HC A23/MF A01

Existing methods of parts stress analysis failure rate prediction, based upon US-MIL-HBK-217C, as applied to microelectronic logic and memory devices are reviewed. The extent to which the failure rate prediction formulas used in MIL HBK 217C are compatible with the physics of the various failure modes experienced, and with the failure statistics available, are investigated. The effects of the failure rate distributions of the various failure modes are considered in relation to the objective of deriving a simple constant-failure-rate prediction model. Proposals are made for methods of improving the effectiveness of micro-electronics reliability prediction both as a design aid and for forecasting, and for areas of further study. A proposed alternative model is presented, with an example of its use to predict the failure rate of a typical system. J.M.S.

N80-19525# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. Dept. of Electrical Engineering.
MARKOVIAN AVAILABILITY MODEL FOR A NETWORK OF COMMUNICATING COMPUTERS
Thad L. Regulinski *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 7 p refs (For primary document see N80-19519 10-38)
Avail: NTIS HC A23/MF A01

The availability function is modeled from a Markovian state-discrete, time-continuous formulation encompassing those adverse conditions which contribute to the network's total down time. The results of three and four state models are derived under assumption of temporally homogeneous, first order, Markovian process. Using sensitivity analysis, the effect of variation of state transition probabilities on the steady state availability function is examined and illustrated by an example. J.M.S.

N80-19528# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France). Div. des Systemes Balistiques et Spatiaux.
FAST ESTIMATION OF THREE PARAMETERS OF WEIBULL LAW [ESTIMATION RAPIDE DES TROIS PARAMETRES D'UNE LOI DE WEIBULL]
Robert Attuly and Christian Bertin *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 27 p refs In FRENCH (For primary document see N80-19519 10-38)
Avail: NTIS HC A23/MF A01

Estimating the three parameters of Weibull distribution is a delicate operation particularly in the case of a small-size population. The maximum likelihood method (M.L.E.) leads to a system of equations requiring considerable calculation; moreover, the convergence of algorithms is not quaranteed by reason of the particular form of the probability function. The saturation method proposed uses the quasi-exhaustivity of a small number of statistics related to the population and gives results near those obtained by the M.L.E. method (when it can be used) and also provides the advantages of being easy, graphic, or

analytic. The method accounts for the size of the sample. Only the statistics associated with the population must be stored in the memory. In addition, the method is free (in the sense of E.T. Jayne) from errors related to the hypothesis of the rule. This point leads to the concept of a reduced parametric hypothesis, and in particular, to the four parametric law which generalizes the Weibull distribution, the gamma function, and the normal density function at the same time. Transl. by A.R.H.

N80-19527# Arinc Research Corp., Annapolis, Md.
RELIABILITY IMPROVEMENT WARRANTY: AN OVERVIEW
Harold S. Balaban *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 9 p refs (For primary document see N80-19519 10-38)
Avail: NTIS HC A23/MF A01

The concept, genesis, and development of reliability improvement warranty (RIW) in the United States is reviewed. The application of RIW concepts to military procurements is dicussed. The rapidly increasing use of this procurement/logistic concept strongly suggests that RIW is now a viable approach to securing reliable and maintainable equipment at a reasonable cost. R.E.S.

N80-19528# Thomson-CSF, Orsay (France).
RELIABILITY CLAUSES IN CONTRACTS [LES CLAUSES DE FIABILITE DANS LES CONTRATS]
J. P. Plantard *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 8 p In FRENCH (For primary document see N80-19519 10-38)
Avail: NTIS HC A23/MF A01

The contents of two documents produced by an interministerial Working Group of the Committee for Telecommunication Coordination are examined with respect to the objectives, the most prominent technical points, and the details for their application. The documents cited contain recommendations for the introduction of reliability clauses for equipment and systems. Guidelines for establishing a reliability plan are included. Transl. by A.R.H.

N80-19529# Crouzet Aerospace and Systems, Valence (France).
THE INCREASE OF THE RELIABILITY OF ELECTRONIC EQUIPMENT SUBJECT TO RELIABILITY CLAUSES [ETUDE DE LA CROISSANCE DE LA FIABILITE D'UN EQUIPMENT ELECTRONIQUE SOUMIS A DES CLAUSES DE FIABILITE]
J. C. Chabin *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 9 p refs In FRENCH (For primary document see N80-19519 10-38)
Avail: NTIS HC A23/MF A01

The appearance of reliability warranties is one of the preponderant factors in the interest shown by equipment manufacturers in techniques for reliability forecasting. The results established at the beginning of work with material are often very far from the forecast, but the different tasks associated with the reliability programs applied to equipment allow for improvement in performance. Knowledge of the rule of reliability growth as a function of the time of accumulated operation of the equipment that is made the object of permanent efforts of improvement, should help the equipment manufacturer to better support his reliability forecast when negotiating a warranty. Transl. by A.R.H.

N80-19530# Service Technique des Telecommunications de l'Air, Paris (France).
RELIABILITY IMPROVEMENT DUE TO THE APPLICATION OF CLAUSES OF OPERATIONAL RELIABILITY [AMELIORATIONS DE FIABILITE DUES A L'APPLICATION DES CLAUSES DE FIABILITE OPERATIONELLE]
J. Laurensou *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 9 p In FRENCH (For primary document see N80-19519 10-38)
Avail: NTIS HC A23/MF A01

Good reliability in the diverse constituents is necessary in order to obtain the good operational availability of any weapon system. All organized bodies charged with provisioning or maintaining equipment are concerned with obtaining the optimum reliability taking into account the imposed financial constraints. Reliability is determined by choices made from the time of equipment design, but it can be improved by observing its real operation and by modifying it. The system used to recognize and improve the reliability of certain equipment used on different aircraft in the French army is described and results are given for a concrete case. To be able to improve the relisibility of equipment, the following are necessary: (1) gather data concerning failures (technical facts); (2) determine the actual reliability during use; (3) define the modifications to be made; (4) persuade the manufacturer to improve the reliability of the equipment and make modifications; and (5) control the incidences of improvements in reliability. Transl. by A.R.H.

N80-19531# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
PRODUCTION RELIABILITY ASSURANCE (PRA): TESTING
Artfried Weihe *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 10 p (For primary document see N80-19519 10-38)
Avail: NTIS HC A23/MF A01

Production reliability assurance (PRA) tests are all-equipment-reliability tests which are applied for assurance purposes during the production phase of major equipments once the formal qualification status concerning reliability is achieved. A fundamental principle of the tests is the liability of the present and/or if the corrective action required (CAR) line is exceeded by the plot of accumulated failures. Suitable test conditions for both producer and customer are obtained by selection of an appropriate CAR line and by restart of the plot after a specific test experience is gained. A comparison with fixed - length tests shows that shorter time to decisions is obtained in the case of PRA testing. R.E.S.

N80-19532# Thomson-CSF, Malakoff (France).
METHODS USED FOR DISCERNING THE RELIABILITY OF MILITARY AIRCRAFT RADAR [METHODES UTILISEES POUR CONNAITRE LA FIABILITE D'UN RADAR D'AVION D'ARMES]
J. C. Charlot *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 20 p In FRENCH (For primary document see N80-19519 10-38)
Avail: NTIS HC A23/MF A01

In an effort to ascertain the reliability of a radar onboard a military aircraft, Thomson-CFS formed an organization to collect and process the information necessary to measure the mean time of good operation. The methods for data acquisition, the members of the organization in 1979, the data management, and prospects for the future (extension to other equipment and information concerning component fabrication) are discussed. Transl. by A.R.H.

N80-19533# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
A FAULT TOLERANT ARCHITECTURE APPROACH TO AVIONICS RELIABILITY IMPROVEMENT
Donald C. Fraser and John J. Deyst *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 9 p refs (For primary document see N80-19519 10-38)
Avail: NTIS HC A23/MF A01

A difficult technology challenge in the reliability of avionics systems for advanced aircraft is identified. Three architectures are compared on the basis of a number of criteria which together constitute the issues which must be examined when considering the overall reliability, maintenance, and support problem. It is concluded from these comparisons and the limitations identified in contemporary approaches that the only effective and practical solution to the reliability challenge is through architecture. An advanced integrated, distributed fault and damage tolerant digital avionics system architecture is summarized which shows promise of meeting this challenge. Author

N80-19534*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
TRENDS IN RELIABILITY MODELING TECHNOLOGY FOR FAULT TOLERANT SYSTEMS
Salvatore J. Bavuso *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 12 P refs (For primary document see N80-19519 10-38)

Avail: NTIS HC A23/MF A01 CSCL 14D

Developments in reliability modeling for large fault tolerant avionic computing systems are presented. Issues of state size and complexity, fault coverage, and practical computation are addressed. A two-fold developmental effort is described based on the structural and fault coverage modeling approaches. A technique which was successfully applied to an 885 state pure death stationary Markov model is presented. Of particular interest is a short computer program which executes very quickly to produce reliability results of a large state space model. This model also incorporates fault coverage states for processor, memory, and bus line replaceable units. A second structural reliability modeling scheme is aimed at solving nonstationary Markov models. This technique provides the tool required for studying the reliability of systems with nonconstant failure rates and includes intermittent/transient faults, electronic hardware which exhibits decreasing failure rates, and hydromechanical devices which typically have wearout failure mechanisms. Several aspects of fault coverage, including modeling and data measurement of intermittent/transient faults and latent faults, are elucidated and illustrated. The CARE II (computer-aided reliability estimation) coverage is presented and shortcomings to be eliminated are discussed. K.L.

N80-19535# Dowty Boulton Paul Ltd., Wolvenhampton (England).

NONELECTRONIC ASPECTS OF AVIONIC SYSTEM RELIABILITY

C. V. Kenmir, R. G. Hilton, and H. H. Dixon *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 12 p (For primary document see N80-19519 10-38)

Avail: NTIS HC A23/MF A01

Methods of obtaining actuation system integrity by means of redundancy are examined. The effects of control surface layout, number of power supplies, and the form of the avionics on the chosen solution are investigated. The affect of redundancy on defect rates is also discussed. Developments which improve reliability and remove constraints are considered. K.L.

N80-19536# Electronique Marcel Dassault, St. Cloud (France).

IMPACTS OF TECHNOLOGIES SELECTED ON THE RELIABILITY AND OPERATIONAL AVAILABILITY OF EQUIPMENTS. COST CONSIDERATIONS

J. M. Girard and M. Giraud *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 17 p refs (For primary document see N80-19519 10-38)

Avail: NTIS HC A23/MF A01

A single criterion, V, is proposed to allow manufacturers to evaluate the merits of technological variants once an equipment baseline version is designed and quoted. The V factor is computed for an airborne digital computer, a Doppler navigational radar, and a search and rescue beacon, each considered in three different versions. K.L.

N80-19537# Rome Air Development Center, Griffiss AFB, N.Y.

A NEW APPROACH TO MAINTAINABILITY PREDICTION

Joseph J. Naresky *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 14 p refs (For primary document see N80-19519 10-38)

Avail: NTIS HC A23/MF A01

A time synthesis maintainability prediction method was developed which directly relates diagnostic, isolation, and test subsystem characteristics to equipment/system maintainability parameters. A comprehensive set of time standards applicable to physical maintenance actions associated with equipment construction and packaging procedures is also provided. Predicted parameters include mean time to repair, maximum time to repair, mean maintenance man hours per repair, and fault isolation resolution. The method includes techniques for use with both preliminary and final design data. K.L.

N80-19538# Westinghouse Defense and Electronic Systems Center, Baltimore, Md.

RELIABILITY GROWTH THROUGH ENVIRONMENTAL SIMULATION

Lawrence J. Phaller *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 8 p refs (For primary document see N80-19519 10-38)

Avail: NTIS HC A23/MF A01

Field data were used to identify unreliable line replaceable units and implement design improvements. The rate of reliability growth was found to be dependent on the unit complexity and the state of the art of the unit. Reliability growth occurred in both design and quality control. K.L.

N80-19539# Marconi-Elliott Avionic Systems Ltd., Rochester (England).

THE A-7 HEAD-UP DISPLAY RELIABILITY PROGRAMME

K. W. Boardman *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 14 p refs (For primary document see N80-19519 10-38)

Avail: NTIS HC A23/MF A01

The evolution of the head-up display from earlier forms of weapon aiming techniques is described. The A-7 head-up display is then introduced in terms of the reliability requirements and the contracting environment. Technical innovations introduced to meet the reliability requirements are described with emphasis on thermal design, ruggedized long life cathode ray tube technology, and durability of low voltage printed circuit connectors. The cost benefit of the reliability program is discussed. K.L.

N80-19540# Army Avionics Research and Development Activity, Fort Monmouth, N. J.

MILITARY ADAPTION OF A COMMERCIAL VOR/ILS AIRBORNE RADIO WITH A RELIABILITY IMPROVEMENT WARRANTY

Earl I. Feder and Douglas L. Niemoller (Bendix Corp., Fort Lauderdale, Fla.) *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 8 p (For primary document see N80-19519 10-38)

Avail: NTIS HC A23/MF A01

Low cost, small, lightweight airborne navigation receivers were acquired and reconfigured to meet U.S. Army aircraft specifications. The contract includes a clause requiring the manufacturer to assume responsibility for the field reliability and repair of each receiver for a minimum of four years. If successfully implemented, the reliability improvement warranty should increase reliability, availability, and maintainability and reduce the overall equipment life cycle costs. K.L.

N80-19541*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

EMULATION APPLIED TO RELIABILITY ANALYSIS OF RECONFIGURABLE, HIGHLY RELIABLE, FAULT-TOLERANT COMPUTING SYSTEMS

Gerard E. Migneault *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 11 p refs (For primary document see N80-19519 10-38)

Avail: NTIS HC A23/MF A01 CSCL 14D

Emulation techniques applied to the analysis of the reliability of highly reliable computer systems for future commercial aircraft are described. The lack of credible precision in reliability estimates obtained by analytical modeling techniques is first established. The difficulty is shown to be an unavoidable consequence of: (1) a high reliability requirement so demanding as to make system evaluation by use testing infeasible; (2) a complex system design technique, fault tolerance; (3) system reliability dominated by errors due to flaws in the system definition; and (4) elaborate analytical modeling techniques whose precision outputs are quite sensitive to errors of approximation in their input data. Next, the technique of emulation is described, indicating how its input is a simple description of the logical structure of a system and its output is the consequent behavior. Use of emulation techniques is discussed for pseudo-testing systems to evaluate bounds on the parameter values needed for the analytical techniques. Finally an illustrative example is presented to demonstrate from actual use the promise of the proposed application of emulation. M.G.

N80-19542# Rome Air Development Center, Griffiss AFB, N.Y. Reliability and Compatibility Div.

RELIABILITY ASSURANCE FOR LARGE SCALE INTEGRATED CIRCUITS

Robert A. McDonald *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 8 p refs (For primary document see N80-19519 10-38)

Avail: NTIS HC A23/MF A01

A procedure for assuring the reliability of large scale integrated circuits is presented. The procedure uses the parts of commercially proven architecture and circuit design while imposing strict procedures on the manufacture and testing of the devices. The program is divided into three broad areas of responsibility. The product evaluation group selects, analyzes, and prepares reports on devices of potential or current interest to the military. The reports are disseminated to government agencies and describe the physical construction, technology, packaging, workmanship, input protection problems, utilization difficulties, and electrical design risks. The electrical characterization group is tasked with characterizing specific devices selected for inclusion in the military specification system. The characterization effort generates the required acceptance tests that each part must pass before use and prepares device detail specifications. Overall effects of circuit loading, technology compatibility, and test vector generation are considered. The reliability assurance group stress tests the devices, assesses the failure modes, and projects a system use failure rate. M.G.

N80-19543# Thomson-CSF, Paris (France). Electron Tube Div.

RELIABILITY OF HIGH-BRIGHTNESS CRTS FOR AIRBORNE DISPLAYS

J. P. Galves and J. Brun *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 14 p (For primary document see N80-19519 10-38)

Avail: NTIS HC A23/MF A01

The reliability of high brightness monochrome or color cathode ray tubes (CRT's) for aircraft head-up display and head-down display systems is examined. The specification, which includes electrooptical performance and environmental conditions, defines the tube quality at zero operating time. Two typical examples of specifications are given. The problems encountered in designing tubes, and the solutions used to obtain the desired level of quality are briefly discussed. Reliability testing concerns random failures that occur during normal operation of the tube. After a short mathematical treatment of the principles involved, three examples of reliability tests carried out on CRT's are given. The electrooptical characteristics of CRT change during operation. This is mainly a cathode and screen wearing-out phenomenon. The life expectancy of a CRT depends on this evolution, and is thus a function of tube operating conditions. M.G.

N80-19544# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).

RELIABILITY INVESTIGATIONS ON AN AUTOMATIC TEST SYSTEM

Hans-Herman Molter *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 13 p refs (For primary document see N80-19519 10-38)

Avail: NTIS HC A23/MF A01

Statistical methods, used to determine the reliability of a complex guided missile test system, are presented. When operating such a system, failures occur which are documented in failure reports. The failure-free periods between successive failure events are evaluated in the context of a Weibull distribution, yielding statements as to the mean time between failures, and the type of failure. The results are used to compare various systems; the influences exerted by differing operating conditions likewise become evident. The values determined in this way also contribute to localizing weak points, thus enabling purposive design measures to further increase the reliability of the test system. M.G.

N80-19545# Naval Postgraduate School, Monterey, Calif.

APPLICATION OF THE LOGNORMAL DISTRIBUTION TO CORRECTIVE MAINTENACE DOWNTIMES

Melvin B. Kline and Ronny Almog (Israeli Navy, Tel Aviv) *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 14 p refs (For primary document see N80-19519 10-38)

Avail: NTIS HC A23/MF A01

An analysis of corrective maintenance downtimes based on the assumption of the lognormal distribution is presented. Approximately 20 sets of existing maintainability demonstration and field data are analyzed using probability plots and goodness-of-fit tests to determine the appropriate distribution and distribution parameters. From the data analysis it is concluded that the lognormal distribution is a good descriptor of the distribution of corrective maintenance repair time. Fifteen of the nineteen cases from maintainability demonstrations of radically different designs tend to show that, with an acceptable level of significance, this assumption cannot be rejected. Similarly, the data analysis shows that the assumption of an exponential distribution should be rejected in seventeen of the cases. The percentage error in the 'mean time to repair', when assuming an exponential distribution instead of a lognormal distribution, as a matter of convenience, for calculating system availability, is found to be small. M.G.

N80-19546# Elliott-Automation Space and Advanced Military Systems Ltd., Camberley (England).

RELIABILITY MANAGEMENT OF THE AVIONIC SYSTEM OF A MILITARY STRIKE AIRCRAFT

A. P. White and J. D. Pavier *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 13 p refs (For primary document see N80-19519 10-38)

Avail: NTIS HC A23/MF A01

The system management techniques to achieve the reliability requirements for the avionic system of the Panavia Tornado aircraft are described. The method of apportionment of these requirements to each of the constituent parts of the system is explained. The aims, cost effectiveness, and experience to date of reliability demonstrations are outlined. M.G.

N80-19547# AEG-Telefunken, Ulm (West Germany).

INTRODUCTION TO SOFTWARE RELIABILITY: A KEY ISSUE OF COMPUTING SYSTEMS RELIABILITY

Gunter Heiner *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 13 p refs (For primary document see N80-19519 10-38)

Avail: NTIS HC A23/MF A01

An introduction to the problems of computing systems reliability is presented with special emphasis on software reliability. A survey of the fundamental approaches to achieve reliable software is given. Starting from a definition of the basic terms and a classification of various error types the concept of software reliability is examined. The problems involved in treating hardware and software reliability on common terms are discussed. For the purpose of illustrating the concept of software reliability, two simple reliability models are presented. The basic methods of attaining reliable computing are divided into the two complementary approaches of fault-avoidance and fault-tolerance. With regard to software reliability fault-avoidance is still the predominant approach. In this category the two classes of constructive and analytical methods are summarized and discussed. Constructive methods facilitate error-free software construction and provide for a good testability of the software. Analytical methods are used for software validation. The main techniques are proving, static, and dynamic analysis. Especially for systems meeting with very high safety requirements, there is need for software fault-tolerance. Two fundamental approaches to fault-tolerance by program diversity are presented and discussed. M.G.

N80-19548# Marconi Radar Systems Ltd., Chelmsford (England). Software Dept.

SOFTWARE RELIABILITY: UNDERSTANDING AND IMPROVING IT

L. Mackie *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 10 p ref (For primary document see N80-19519 10-38)

Avail: NTIS HC A23/MF A01

Concepts regarding software reliability are examined. Definitions are given of software, its quality, errors and software reliability. A few realities of software development are considered such as: the hardware/software people system; software requirements specifications; software testing; detection and correction of errors; and time necessary for software development. R.C.T.

N80-19549*# SRI International Corp., Menlo Park, Calif. Computer Science Lab.

FORMAL METHODS FOR ACHIEVING RELIABLE SOFTWARE

Jack Goldberg *In* AGARD Avionics Reliability, Its Tech. and

Related Disciplines Oct. 1979 9 p refs (For primary document see N80-19519 10-38)
(Contracts NAS1-13792; N00123-78-C-0195)
Avail: NTIS HC A23/MF A01

Requirements for reliable avionic systems are discussed in terms of the effectiveness of programming methodology. The need for methods to cope with the complexity of critical real-time systems is emphasized. Some general concepts about formal methods are presented and an example is given of the SRI hierarchical development methodology taken from the executive system of the SIFT fault tolerant computer. Formal methods with alternatives are compared and the prospects for introducing formal methods into practice are considered. R.C.T.

N80-19550# Institut de Recherche d'Informatique et d'Automatisme, Roquencourt (France).
QUANTITATIVE ASSESSMENTS OF SOFTWARE RELIABILITY
J. C. Rault, G. Mammi (ECA Automation, Saint-Cloud, France), and S. Dimont *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 11 p refs Prepared in cooperation with Thomson-CSF, Paris (For primary document see N80-19519 10-38)
Avail: NTIS HC A23/MF A01

A categorization and a description is given of those quantitative measures of software reliability leading to practical applications. The main approaches to quantitatively assessing software reliability are identified: models adapted from classical reliability theory wherein reliability is expressed in terms of software error rate; models based on sampling techniques applied to the error domain or to the input data domain; here reliability is related respectively to an estimate of the number of residual errors and to the probability of not using those input data leading to software failures; models based on program complexity measures; their basic principle is attempting to discover correlations between complexity measures and the most likely number of errors made during programming. Underlying assumptions and areas of application are indicated. It is concluded to the existence of methods of practical interest and of data that might help to understand how often, when, where, and why programmers introduce software errors and how software errors may be detected and corrected. R.C.T.

N80-19551# Rome Air Development Center, Griffiss AFB, N.Y.
AN ANALYSIS OF SOFTWARE RELIABILITY PREDICTION MODELS
Alan N. Sukert *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 11 p refs (For primary document see N80-19519 10-38)
Avail: NTIS HC A23/MF A01

Several mathematical models for predicting the reliability and error content of a software package were evaluated against error data extracted from the formalized testing of four software development projects. The results of the data collected are described using both Maximum Likelihood and Least Squares methods for estimating model parameters. Model predictions are compared on a total project, functional and error severity basis. Model predictions are also compared on an errors/day and errors/week basis for defining model time intervals. Conclusions concerning the application of these models are presented. R.C.T.

N80-19552# Gesellschaft fuer Wirtschaftliche Bautechnik m.b.H., Munich (West Germany).
ANALYTICAL SOFTWARE VERIFICATION
W. Ehrenberger and P. Puhr-Westerheide *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 25 p refs (For primary document see N80-19519 10-38)
Avail: NTIS HC A23/MF A01

Various methods for verifying the correctness of software are discussed. An example of a manual program analysis is given. A FORTRAN subroutine is analyzed, which consists of 166 code lines. Some automatic analysis methods are also discussed. A short survey is given on the various analysis methods used by automated testing tools. In the overall system level, the different kinds of applied testing strategies are mentioned. Testing in detail requires a convenient embedding of the modules to be tested. It is shown that testing in the module level can be done due to different methods as static analysis and dynamic analysis. R.C.T.

N80-19553# Bundesamt fuer Wehrtechnik und Beschaffung, Koblenz (West Germany). Dept. of Quality Assurance of Electronic Systems.
SOFTWARE QUALITY AND ITS ASSURANCE
P. Weigel *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 11 p refs (For primary document see N80-19519 10-38)
Avail: NTIS HC A23/MF A01

The causes of failure and the development of software are discussed, and the technical means and measures for eliminating faults and impacting the software quality are described. In addition to the technical measures, the organizational means of software quality assurance are summarized. R.C.T.

N80-19554# Elliott-Automation Space and Advanced Military Systems Ltd., Camberley (England).
SOFTWARE DEVELOPMENT FOR TORNADO: A CASE HISTORY FROM THE RELIABILITY AND MAINTAINABILITY ASPECT
D. J. Harris *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 23 p (For primary document see N80-19519 10-38)
Avail: NTIS HC A23/MF A01

The methods and procedures adopted in the development program for the TORNADO aircraft are presented. Software development for TORNADO has been undertaken in four successive, but overlapping phases, namely definition, writing, testing and delivery. The key features in these four phases are given that have contributed to software reliability and maintainability. R.C.T.

N80-19555# Westinghouse Electric Corp., Hunt Valley, Md. Defense and Electronic System Center.
INTEGRATED LOGISTICS SUPPORT ADDS ANOTHER DIMENSION TO MATRIX MANAGEMENT
Richard M. Drake *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 11 p (For primary document see N80-19519 10-38)
Avail: NTIS HC A23/MF A01

The application of matrix management to integrated logistics support (ILS) is defined as a management and functional process for unified, coordinated acquisition of logistic resources required to support systems and equipments at all echelons of maintenance throughout their planned period of usefulness. The concept involves the scientific management of all necessary logistic products and services over the system life cycle with particular emphasis upon coherence, timeliness, execution, and reliability. The various elements of logistics services and the integration with matrix management are illustrated. The advantages and disadvantages of the integration are delineated and organizational diagrams are presented. The program management process is discussed with emphasis given to integrated quantitative planning and ILS products such as communicating and direction, and life cycle costs. A.W.H.

N80-19556# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Product Support Dept.
MEK: A NEW PROCEDURE FOR DEVELOPMENT OF MAINTENANCES POLICIES
Klaus Lewandowski *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 10 p (For primary document see N80-19519 10-38)
Avail: NTIS HC A23/MF A01

A procedure for the development of maintenance policies is presented for the general application in weapon system projects. The procedure is based on a detailed collection and evaluation of the maintenance expenditure expected for the weapon system. The maintenance expenditure is based upon the system technology, the reliability and maintability attributes including the given lifetime limitations, and the operational requirements and logistic concepts. The procedure is illustrated with an analysis of each step in the data collection process. The data collection process as defined begins with the task frequencies or specified values of the system specifications, proceeds to scheduled maintenance requirements, maintenance levels, personnel requirements,

technical publication requirements, and unscheduled maintenance requirements, and ends with a summary of the results. A.W.H.

N80-19557# Westinghouse Electric Corp., Hunt Valley, Md. Integrated Logistics Support Div.
THE IMPORTANCE OF INTEGRATED LOGISTICS SUPPORT CONSIDERATIONS DURING DESIGN
Robert C. Rassa *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 5 p (For primary document see N80-19519 10-38)
Avail: NTIS HC A23/MF A01

The relationship and interdependency of the integrated logistics support elements and their relationship to the design of the prime mission equipment is explored. The roles of the key personnel involved in the initial considerations are examined. Rules for the successful implementation of an integrated logistics support plan are developed and presented. A.W.H.

N80-19558# Ministry of Defence, London (England). Procurement Div.
THE INTEGRATED MANAGEMENT OF RELIABILITY AND MAINTAINABILITY IN PROCUREMENT
S. E. Shapcott and K. A. Brown *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 4 p (For primary document see N80-19519 10-38)
Avail: NTIS HC A23/MF A01

An effective procurement strategy for reliability and maintainability is discussed as documented in the DCAD Technical Publication 1/77: Achievement of Avionic Reliability and Maintainability through Integrated Management. The evolution of the strategy is reviewed, the requirements of the strategy are discussed, and the implementation of the strategy is examined. A.W.H.

N80-19559# Royal Air Force, Dereham (England). RAF Maintenance Data Centre.
RELIABILITY AND SUPPORT DATA FOR STATISTICAL EVALUATION
A. Andrews *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 14 p (For primary document see N80-19519 10-38)
Avail: NTIS HC A23/MF A01

The organization and procedures for aircraft data collection, using the maintenance data system, are described together with the methods of data storage, retrieval, and analysis. Various applications of the data as part of an integrated reliability management program are outlined. The problems in collecting and interpreting field data are discussed and difficulties in relating the data to the reliability measured in the design and development stages of new equipment are described. A.W.H.

N80-19560# Ministry of Defence, London (England).
COMPUTER SIMULATION MODEL OF THE LOGISTIC SUPPORT SYSTEM FOR ELECTRICAL ENGINEERING TEST EQUIPMENT
C. J. P. Haynes *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 13 p (For primary document see N80-19519 10-38)
Avail: NTIS HC A23/MF A01

A simulation model of the existing logistic support system for electrical engineering test equipment, developed as a research tool for evaluating the adequacy of analytical provisioning models is described. Two further simulations, developed to model alternative logistic support systems and to compare these with the current maintenance organization, are also described. The present logistic support system, the development of the three simulation models, and their potential uses are discussed. A.W.H.

N80-19561# Arinc Research Corp., Annapolis, Md.
THE RELIABILITY IMPROVEMENT WARRANTY AND ITS APPLICATION TO THE F-16 MULTINATIONAL FIGHTER PROGRAM
George Harrison *In* AGARD Avionics Reliability, Its Tech. and Related Disciplines Oct. 1979 9 p (For primary document see N80-19519 10-38)
Avail: NTIS HC A23/MF A01

The F-16 multinational fighter program is described, with particular emphasis on two aspects: the development of the F-16 reliability improvement warranty (RIW) program, and the coproduction agreements between the U.S. and the governments of Belgium, Denmark, Norway, and the Netherlands. The fundamentals of an RIW procurement, together with some of the variations that were used to suit particular applications, are described. Guidelines for RIW application are presented. A.W.H.

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N80-19562 Illinois Univ. at Urbana-Champaign.
AN APPROXIMATE FINITE-ELEMENT METHOD OF STRESS ANALYSIS OF NON-AXISYMMETRIC BODIES WITH ELASTIC-PLASTIC MATERIAL BEHAVIOR Ph.D. Thesis
James Neil Craddock 1979 143 p
Avail: Univ. Microfilms Order No. 8004169

A finite element method of analysis is developed for structural configurations which are derived from axisymmetric geometries but contain definite nonaxisymmetric features in the circumferential direction. The fact that the stress and strain conditions in these geometries are related to the corresponding axisymmetric solution is taken into consideration. A number of examples are presented and discussed to illustrate the accuracy of the method. The method of analysis is developed in two versions. The first version is for elastic, orthotropic materials. The second method is for elastic-plastic materials with a kinematic strain hardening model. As in the case of the elastic version, the second version also allows for orthotropic properties and the yield criterion is based on the Hill's yield function which reduces in the limit to von Mises-Hencky for isotropic materials. Dissert. Abstr.

N80-19563*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
HYDROELASTIC VIBRATION ANALYSIS OF PARTIALLY LIQUID-FILLED SHELLS USING A SERIES REPRESENTATION OF THE LIQUID
Jerrold M. Housner, Robert W. Herr, and John L. Sewall Mar. 1980 68 p refs
(NASA-TP-1558; L-13279) Avail: NTIS HC A04/MF A01 CSCL 20K

A series representation of the oscillatory behavior of incompressible nonviscous liquids contained in partially filled elastic tanks is presented. Each term is selected on the basis of hydroelastic vibrations in circular cylindrical tanks. Using a complementary energy principle, the superposition of terms is made to approximately satisfy the liquid-tank interface compatibility. This analysis is applied to the gravity sloshing and hydroelastic vibrations of liquids in hemispherical tanks and in a typical elastic aerospace propellant tank. With only a few series terms retained, the results correlate very well with existing analytical results, NASTRAN-generated analytical results, and experimental test results. Hence, although each term is based on a cylindrical tank geometry, the superposition can be successfully applied to noncylindrical tanks. K.L.

N80-19564*# Iowa Univ., Iowa City. Div. of Materials Engineering.
THE EFFECT OF TEST SYSTEM MISALIGNMENT IN THE DYNAMIC TENSION TEST
Han C. Wu, T. P. Wang, and M. C. Yip 1 Mar. 1980 44 p refs
(Grant NsG-1499)
(NASA-CR-162829; Rept-G302-80-001) Avail: NTIS HC A03/MF A01 CSCL 20K

The effects of test system misalignment are analyzed for dynamic tension tests using sheet type rectangular 1100-0 aluminum specimens. The strain rate is assumed constant only on the natural axis of the specimen even though the specimen is subjected to a constant strain rate test. The results include: (1) the lower the strain rate, the more significant the misalignment

errors become; (2) misalignment errors of 50% are found at the extreme fibers of the specimen; (3) the strain rate variation in the cross section decreases with increasing plastic strain and vanishes at plastic strain equal to 0.8% at the midspan of the specimen; and (4) the neutral axis shifts toward the centerline of the specimen as the plastic strain increases, but it reaches a limit and does not completely move back to the centerline. K.L.

N80-19565*# National Aeronautics and Space Administration, Washington, D. C.
THEORY OF TWISTED NONUNIFORMLY HEATED BARS
B. F. Shorr Feb. 1980 21 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Otd. Tekhn. Nauk Mekhan. i Mashinostr. (USSR), no. 1, Jan.-Feb. 1960 p 141-151 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75758) Avail: NTIS HC A02/MF A01 CSCL 20K

Nonlinearly distributed stresses in twisted nonuniformly heated bars of arbitrary cross section are calculated taking into account various elasticity parameters. The approximate theory is shown to be sufficiently general and accurate by comparison with experimental data. K.L.

N80-19568*# Boeing Co., Wichita, Kans.
DEVELOPING, MECHANIZING AND TESTING OF A DIGITAL ACTIVE FLUTTER SUPPRESSION SYSTEM FOR A MODIFIED B-52 WIND-TUNNEL MODEL Final Report, Jul. 1975 - Jan. 1980
John R. Matthew Mar. 1980 129 p refs
(Contract NAS1-14031)
(NASA-CR-159155; D3-1168-1) Avail: NTIS HC A07/MF A01 CSCL 01A

A digital flutter suppression system was developed and mechanized for a significantly modified version of the 1/30-scale B-52E aeroelastic wind tunnel model. A model configuration was identified that produced symmetric and antisymmetric flutter modes that occur at 2873N/sq m (60 psf) dynamic pressure with violent onset. The flutter suppression system, using one trailing edge control surface and the accelerometers on each wing, extended the flutter dynamic pressure of the model beyond the design limit of 4788N/sq m (100 psf). The hardware and software required to implement the flutter suppression system were designed and mechanized using digital computers in a fail-operate configuration. The model equipped with the system was tested in the Transonic Dynamics Tunnel at NASA Langley Research Center and results showed the flutter dynamic pressure of the model was extended beyond 4884N/sq m (102 psf).
J.M.S.

N80-19567# General Dynamics Corp. Fort Worth, Tex.
FASTENER HOLE QUALITY, VOLUME 1 Final Technical Report, Jun. 1976 - Oct. 1978
P. J. Noronha, S. P. Henslee, D. E. Gordon, Z. R. Wolanski, and B. G. W. Lee Wright-Patterson AFB, Ohio AFFDL Dec. 1978 165 p
(Contract F33615-76-C-3113; AF Proj. 486U)
(AD-A077859; FZM-6809-Vol-1; AFFDL-TR-78-206-Vol-1) Avail: NTIS HC A08/MF A01 CSCL 13/5

This report describes the development of the equivalent initial flaw size concept as a potential design tool and the generation of equivalent initial flaw size data as a function of several manufacturing and design variables. Several factors or mechanisms that strongly affected the fatigue behavior of fastener holes have been identified and corrected to achieve a 100% improvement in fatigue life. Some of these improvements are being implemented in the F-16 production program and the improved drilling will be implemented in the C5A-H Modification Program. GRA

N80-19568# Naval Postgraduate School, Monterey, Calif.
DYNAMIC STRUCTURAL MODEL OF A SUBMERGED RING M.S. Thesis
Jack Thomas Waller, Jr. Sep. 1979 51 p refs
(AD-A078157) Avail: NTIS HC A04/MF A01 CSCL 13/10

A dynamic structural model of a submerged ring is developed using trigonometric series. It is constructed for use in conjunction with a finite element fluid model to examine the effects of cavitation on underwater shock loading of a structure. The governing equations and the time integration algorithm used in the model are described. Results predicted by the model are compared to known results. The program listing is given. GRA

N80-19569# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
AN ANALYSIS OF RESIDUAL STRESSES AND DISPLACEMENTS DUE TO RADIAL EXPANSION OF FASTENER HOLES Final Report, Jan. 1975 - Dec. 1978
A. F. Grandt and R. M. Potter Jul. 1979 37 p refs
(AF Proj. 2307)
(AD-A076370; AFML-TR-79-4048) Avail: NTIS HC A02/MF A01 CSCL 01/3

Pre-expanding fastener holes with an oversize mandrel has received considerable attention for use in aircraft structures, since this process has been shown to greatly improve the fatigue life of fastener holes. The deformation theory of plasticity is used here to determine the residual stress and displacement field caused by this process. Employing plane stress assumptions, general results are obtained for various interference levels and are presented in a graphical form useful to the designer. In addition, this analysis indicates that there is an optimum level of interference dependent primarily on the plate geometry. The optimum interference levels agree well with experience values established by fatigue testing in aircraft structural alloys. GRA

N80-19570# Sydney Univ. (Australia). Civil Engineering Labs.
NUMERICAL ANALYSIS OF RAFTS ON VISCO-ELASTIC MEDIA USING EIGENVECTOR EXPANSIONS
P. T. Brown and J. R. Booker Apr. 1979 41 p refs
(PB80-112907; R-346) Avail: NTIS HC A03/MF A01 CSCL 13B

Problems of a raft on a viscoelastic continuum are converted to equivalent elastic problems by means of a Laplace transformation. A numerical solution of the equivalent problem is obtained by the finite element method. The solution is converted into the form of an eigenvector expansion and then transformed into a numerical solution to the original problem by inverting the Laplace transform. This form of solution has the advantage of applying to any viscoelastic model, and of requiring little additional computation as a result of changing the viscoelastic model, the relative raft-soil stiffness or the load pattern. The application of the method is illustrated by results for circular rafts, strip footings of finite length, and rectangular rafts. Particular attention is paid to a realistic soil creep function which is asymptotic to a linear function or log time. GRA

N80-19571# Sydney Univ. (Australia). Civil Engineering Labs.
SURFACE SETTLEMENT OF A FINITE ELASTIC LAYER WHOSE MODULUS INCREASES LINEARLY WITH DEPTH
P. T. Brown and R. E. Gibson Apr. 1979 28 p refs
(PB80-112899; R-345) Avail: NTIS HC A03/MF A01 CSCL 13B

The behavior of a finite layer of elastic material of constant Poisson's ratio which has a Young's modulus increasing linearly with depth and which rests on a rough rigid base, is investigated. Values of surface settlement at the center of a circular area of uniform loading and at the corner of a rectangular area of uniform loading are presented for values of Poisson's ratio of 1/2, 1/3 and 0, and for wide ranges of degree of inhomogeneity and loading breadth to depth ratio. GRA

N80-19572# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
DAMPING EFFECTS IN AEROSPACE STRUCTURES
Oct. 1979 193 p refs In ENGLISH and FRENCH Meeting held in Williamsburg, Va., 2-3 Apr. 1979
(AGARD-CP-277; ISBN-92-835-0244-2) Avail: NTIS HC A09/MF A01

Mathematical models, vibration tests, and predictions of structural damping are discussed in terms of aerospace problems where structural damping plays a basic role. Topics addressed include numerical modelling of structures to account for internal damping, spacecraft damping considerations in structural design, damping problems in acoustic fatigue, and damping effects in

joints and riveted specimens. For individual titles, see N80-19573 through N80-19584. A.W.H.

N80-19573# National Aerospace Lab., Amsterdam (Netherlands).
MATHEMATICAL FORMULATION OF DAMPING FOR STRUCTURAL RESPONSE ANALYSIS
H. H. Ottens *In* AGARD Damping Effects in Aerospace Struct. Oct. 1979 10 p refs (For primary document see N80-19572 10-39)
Avail: NTIS HC A09/MF A01

A survey of damping models that are commonly used in the structural response analysis of aerospace structures is presented. The various damping models are evaluated with respect to the required knowledge of structural damping, the mathematical complexity and the accuracy of the calculated response. The survey is limited to linear damping models and models which represent lightly damped structures are highlighted. A.W.H.

N80-19574# Southampton Univ. (England). Dept. of Aeronautics and Astronautics.
PREDICTION OF THE STRUCTURAL DAMPING OF A VIBRATING STIFFENED PLATE
Denys J. Mead *In* AGARD Damping Effects in Aerospace Struct. Oct. 1979 15 p refs (For primary document see N80-19572 10-39)
Avail: NTIS HC A09/MF A01

The sources of energy dissipation in a vibrating stiffened plate, typical of a fuselage stringer skin structure are outlined. For a particular specimen, the principal source was identified as the riveted joints attaching the skin to the stringer. These undergo oscillating tension/compression loads (in the direction of the rivet axis) when the plate vibrates. An experiment to measure the basic damping characteristic of a single riveted joint loaded harmonically is described. The non-linearity of the damping was demonstrated, as was the effect of an air pumping mechanism in the joint. The results of the experiment were used to predict the damping of a riveted stringer skin structure containing many such joints. The predicted damping is compared with the value actually measured. The results are of the same order of magnitude, but the numerical difference highlights the difficulties involved in undertaking such damping studies. A.W.H.

N80-19575# Genoa Univ. (Italy). Istituto di Scienza delle Costruzioni.
NUMERICAL MODELLING OF STRUCTURES TO ACCOUNT FOR INTERNAL DAMPING
Riccardo F. Baldacci, Alfred Corsanego, and Andrea DelGrosso *In* AGARD Damping Effects in Aerospace Struct. Oct. 1979 9 p refs (For primary document see N80-19572 10-39)
Avail: NTIS HC A09/MF A01

Various numerical analysis techniques are examined concerning the inclusion of the structural damping effects from the point of view of representing the structural behaviour by means of finite element models. The consequences of assuming some of the more popular damping models are discussed in terms of the solution algorithms. Uncoupling techniques that are only approximate when the structural models possess a nonproportional damping matrix are emphasized and criticized. Various diagonalization schemes are presented for the damping matrix and emphasis is given to the evaluation of the errors involved in the computation. A.W.H.

N80-19576# British Aerospace Aircraft Group, Brough (England).
SOME RECENT MEASUREMENTS OF STRUCTURAL DYNAMIC DAMPING IN AIRCRAFT STRUCTURES
E. J. Phillips *In* AGARD Damping Effects in Aerospace Struct. Oct. 1979 15 p refs (For primary document see N80-19572 10-39)
Avail: NTIS HC A09/MF A01

Values of structural damping obtained during a flutter investigation of a strike aircraft in several wing store configurations, in which the wings were excited by impulses at the wing tips are presented. A vibration test on a large underwing pylon mounted pod during which three suspensions were represented, and a vibration test on a box section shelf mounted on antivibration mounts are described. During the flutter investigation the structural damping was determined from the time decay of filtered accelerometer signals. In the vibration tests, the test items were excited sinusoidally and damping was obtained from accelerometer response curves at resonance. A.W.H.

N80-19577# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Aeroelastik.
EFFECT OF STRUCTURAL DAMPING ON THE DYNAMIC RESPONSE OF SPACECRAFT
M. Degener *In* AGARD Damping Effects in Aerospace Struct. Oct. 1979 19 p refs (For primary document see N80-19572 10-39)
Avail: NTIS HC A09/MF A01

The effect of structural damping on the dynamic response of spacecraft structures, especially satellites, is investigated. Special regard is given to the influence of intermodal damping coupling and of a nonlinear damping behaviour. Results of dynamic tests on satellite structures are studied. A method is presented to determine the dynamic response of a spacecraft structure, taking into account the nonlinear damping behaviour by means of a numerical, iterative procedure based on modal data. A.W.H.

N80-19578*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SPACECRAFT DAMPING CONSIDERATIONS IN STRUCTURAL DESIGN
B. K. Wada and D. T. DesForges *In* AGARD Damping Effects in Aerospace Struct. Oct. 1979 18 p refs (For primary document see N80-19572 10-39)
(Contract NAS7-100)
Avail: NTIS HC A09/MF A01

The role of damping in the prediction of spacecraft structural responses and loads, and in the structural design of spacecrafts is discussed. The methods used to incorporate damping in the structural analysis are summarized and some experiences and procedures relating to damping in recent spacecraft design are discussed. Methods for modal testing and the experimental determination of damping, the use of discrete dampers, and the estimation of payload response are studied. A collection of damping data for recent spacecraft and related hardware is provided in the appendix. A.W.H.

N80-19579# Rome Univ. (Italy). Scuola d'Ingegneria Aerospaziale.
VIBRATION DAMPING ON SAN MARCO SATELLITES: RESULTS AND COMMENTS
Carlo Arduini and Alessandro Agneni *In* AGARD Damping Effects in Aerospace Struct. Oct. 1979 15 p refs (For primary document see N80-19572 10-39)
Avail: NTIS HC A09/MF A01

The damping data from dynamic tests of the San Marco structures is surveyed. The typical trend of the damping coefficient to decrease with frequency is confirmed. However, there is no clear evidence of significant variations with the input level. This feature is discussed in terms of the limits of the half power method. K.L.

N80-19580# Politecnico di Milano (Italy). Istituto di Ingegneria Aerospaziale.
DAMPING PROBLEMS IN ACOUSTIC FATIGUE
Vittorio Giavotto, Marco Borri, and Giorgio Cavallini (Pisa Univ.) *In* AGARD Damping Effects in Aerospace Struct. Oct. 1979 11 p refs (For primary document see N80-19572 10-39)
Avail: NTIS HC A09/MF A01

Damping information necessary for the fatigue design of wideband noise excited structures is identified. Damping mechanisms are considered and damping test results are presented for stiffened panels typical of aerospace structures. The need for models capable of accurately estimating damping effects is emphasized. K.L.

N80-19581# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany). Inst. fuer Bauweisen- und Konstruktionsforschung.
DYNAMIC DAMPING INVESTIGATIONS ON COMPOSITES
H. Georgi *In* AGARD Damping Effects in Aerospace Struct. Oct. 1979 20 p refs (For primary document see N80-19572 10-39)

Avail: NTIS HC A09/MF A01

Characteristic regularities and data from a series of damping measurements on fiber reinforced composite materials and structures are presented. Experiments were carried out mainly on natural frequencies of lateral vibrations in free decay and forced excitation. Tests included composite materials with reinforcement by boron, carbon, glass, and synthetic fibers; structural components, sandwich and I-beams; and composite structures such as rotor blades. Experimental parameters considered were amplitude, temperature, vibration mode, frequency, air pressure, aspect ratio, and fiber orientation. Dynamic response properties of several composites were compared by means of a simple linear oscillation model with spring, mass, and damping values corresponding to the composite data. The structural damping of a wing box and a wind turbine blade was compared with the damping of the respective structural element. Numerical extrapolations of the damping behavior of beams differing from experimental configurations in fiber orientation, air pressure, etc. are discussed. K.L.

N80-19582*# Air Force Materials Lab., Wright-Patterson AFB, Ohio.

VISCOELASTIC DAMPING IN USAF APPLICATIONS

D. I. G. Jones, J. P. Henderson, and L. C. Rogers (AFFDL, Wright-Patterson AFB, Ohio) *In* AGARD Damping Effects in Aerospace Struct. Oct. 1979 24 p refs (For primary document see N80-19572 10-39)

Avail: NTIS HC A09/MF A01

The use of viscoelastic damping technology for vibration control in the United States Air Force is reviewed. The potential payoff in improved performance and maintainability of vibration critical systems such as large flexible spacecraft structures, digital electronics systems, and rotating jet engine components is very high. K.L.

N80-19583# Societe METRAVIB, Ecully (France).

REPORT ON THE USE OF ABATEMENT TECHNIQUES FOR PROBLEMS RELATED TO VIBRATIONS AND NOISE [BILAN SUR LA MISE EN OEUVRE DE TECHNIQUES D'AMORTISSEMENT POUR DES PROBLEMES LIES AUX VIBRATIONS ET AU BRUIT]

B. Duperray and L. Gaudriot *In* AGARD Damping Effects in Aerospace Struct. Oct. 1979 9 p In FRENCH (For primary document see N80-19572 10-39)

Avail: NTIS HC A09/MF A01

The 10 year history of METRAVIB involvement in using viscoelastic materials to solve the vibration and noise problems encountered in the industrial, mechanical, electrical, and naval and aerospace construction sectors is reviewed. Particular attention is given to the development of models of structural dynamics, and a viscoelastimeter as well as the transfer of information to industries interested in developing new products using glass fiber reinforced composites and high temperature materials such as glasses and ceramics. Specific applications are cited to demonstrate the effectiveness of the techniques used. Transl. by A.R.H.

N80-19584# Istituto di Tecnologie Aerospaziale, Rome (Italy).

DAMPING EFFECTS IN JOINTS AND EXPERIMENTAL TESTS ON RIVETED SPECIMENS

Luigi Balis Crema, Antonio Castellani, and Alfonso Nappi (SIAI Marchetti) *In* AGARD Damping Effects in Aerospace Struct. Oct. 1979 17 p refs (For primary document see N80-19572 10-39)

Avail: NTIS HC A09/MF A01

The importance of dynamic damping is highlighted with emphasis on the effect of riveted joints on energy dissipation. The state of the art in the field of joint damping is illustrated with reference to several theories on damping mechanisms. Results of tests carried out on specimens with riveted joints are discussed. K.L.

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography. For instrumentation see 35 *Instrumentation and Photography*.

N80-19585*# Lille Univ. (France).

SEA SURFACE TEMPERATURE OF THE COASTAL ZONES OF FRANCE. HEAT CAPACITY MAPPING MISSION (HCMM) Progress Report

P. Y. Deschamps, R. Frouin, G Cassanet, and F. Verger, Principal Investigators Dec. 1979 53 p refs Sponsored by NASA Original contains imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code 601), Greenbelt, Md. 20711. Domestic users send orders to 'Attn: National Space Science Data Center'; non-domestic users send orders to 'Attn: World Data Center A for Rockets and Satellites'. HCMM

(E80-10057; NASA-CR-162753; PR-2) Avail: NTIS HC A04/MF A01 CSCL 08C

The author has identified the following significant results. HCMM data analysis shows some mesoscale features which were previously expected to occur: summer coastal upwellings in the Gulf of Lions, tidal fronts bordering the English Channel, and cooler surface waters at the continental shelf break. The analysis of the spectral variance density spectra show that the interpretation of the data usually is limited by the HCMM radiometric performance (noise levels) at wavenumbers below 5 km in the oceanic areas; from this analysis it may also be concluded that a decrease of the radiometric noise level down to 0.1 k against an increase of the ground resolution up to 2 km would give a better optimum of the radiometric performances in the oceanic areas. HCMM data appear to be useful for analysis of the sea surface temperature field, particularly in the very coastal area by profiting from the ground resolution of 500 m.

N80-19586*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex. Systems and Services Div.

AS-BUILT DESIGN SPECIFICATIONS OF THE LANDSAT IMAGERY VERIFICATION AND EXTRACTION SYSTEM (LIVES). VOLUME 1: TEST AND APPENDICES

J. Everette, A. Rios, J. Good, C. Horton, D. McCarley, and M. Nieves, Principal Investigators Dec. 1979 335 p ERTS (Contract NAS9-15800)

(E80-10077; NASA-CR-160461; LEC-12904-Vol-1; JSC-14634-Vol-1) Avail: NTIS HC A15/MF A01 CSCL 05B

There are no author-identified significant results in this report.

N80-19587*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

QUANTITATIVE ESTIMATION OF PLANT CHARACTERISTICS USING SPECTRAL MEASUREMENT: A SURVEY OF THE LITERATURE

R. B. Cate, J. A. Artley, and D. E. Phinney, Principal Investigators Jan. 1980 43 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior and Agency for International Development ERTS

(Contract NAS9-15800; Proj. AgRISTARS)

(E80-10078; NASA-CR-160460; LEMSCO-14077; JSC-16298; SR-LO-00408) Avail: NTIS HC A03/MF A01 CSCL 02C

There are no author-identified significant results in this report.

N80-19588*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

LANDSAT DIGITAL ANALYSIS OF THE INITIAL RECOVERY OF THE KOKOLIK RIVER TUNDRA FIRE AREA, ALASKA
D. K. Hall, J. P. Ormsby, L. Johnson (Army Cold Regions Research and Engineering Lab., Fairbanks, Alaska), and J. Brown, Principal Investigators (Army Cold Regions Research and Engineering Lab., Hanover, N. H.) Dec. 1979 21 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS
(E80-10080; NASA-TM-80602) Avail: NTIS HC A02/MF A01 CSCL 08G

The author has identified the following significant results. Considerable regrowth of vegetation was observed between August 1977 and August 1978, both in the field and through analysis of LANDSAT near infrared digital data. The spectral reflectances in the burned areas were found to increase with the age of the burn in a one year period due to vegetation regrowth. Regrowth was particularly evident in the lightly burned portions of the burned area. Image analysis techniques using the AOIPS system permitted delineation of burn severity categories. The conditions and type of ground cover prior to the fire influenced the severity of burning, as did the direction of the winds while the burning was in progress as determined from field and LANDSAT observations. More severe burning was induced by winds blowing in the northeastern and southeastern portions of the burned area.

N80-19589*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SMMR SIMULATOR RADIATIVE TRANSFER CALIBRATION MODEL. 1: DERIVATION
Charles D. Calhoun, Susan Link, Michael Doyle, and Brian Krupp, Principal Investigators (Systems and Applied Sciences Corp., Riverdale, Md.) Aug. 1979 67 p refs ERTS
(E80-10081; NASA-TM-80244) Avail: NTIS HC A04/MF A01 CSCL 14B

There are no author-identified significant results in this report.

N80-19590*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A CRITICAL COMPARISON OF REMOTE SENSING AND OTHER METHODS FOR NONDESTRUCTIVE ESTIMATION OF STANDING CROP BIOMASS
C. J. Tucker, Principal Investigator Dec. 1979 15 p refs Submitted for publication ERTS
(E80-10082; NASA-TM-80607) Avail: NTIS HC A02/MF A01

There are no author-identified significant results in this report.

N80-19591*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MULTISENSOR ANALYSIS OF HYDROLOGIC FEATURES IN THE WIND RIVER RANGE, WYOMING WITH EMPHASIS ON THE SEASAT SAR
James L. Foster and Dorothy K. Hall, Principal Investigators Oct. 1979 26 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(E80-10083; NASA-TM-80582) Avail: NTIS HC A03/MF A01 CSCL 08H

The author has identified the following significant results. Analysis of imagery obtained over west-central Wyoming indicates that Seasat SAR has capability for hydrologic mapping. Both the L-Band (Seasat) and the X-Band (aircraft) SAR imagery were useful for observing drainage detail. Streams have bright signatures on the SAR imagery because the riparian vegetation produces a rough surface and thus high radar returns. Lakes appear relatively bright on the Seasat image presumably in response to surface ripples and waves induced by wind action. SAR imagery did not reveal snow at either the 23.5 cm (L-Band) or 2.8 cm (X-Band) wavelengths. Comparing Seasat and X-Band aircraft SAR imagery to LANDSAT RBV imagery, U-2 photography, and topographic maps of the Wind River Range, it appears that the SAR data do not seem to provide as much hydrologic information as do the other sensors in the visible and near infrared portions of the spectrum.

N80-19592*# Michigan State Univ., East Lansing.
USE OF REMOTE SENSING FOR LAND USE POLICY FORMULATION Annual Progress Report, 1 Jun. 1978 - 31 May 1979
Myles Boylan, Principal Investigator 1 Feb. 1980 113 p refs ERTS
(Grant NGL-23-004-083)
(E80-10085; NASA-CR-162783) Avail: NTIS HC A06/MF A01 CSCL 05B

There are no author-identified significant results in this report.

N80-19593*# South Dakota State Univ., Brookings. Remote Sensing Inst.
REMOTE SENSING APPLICATIONS TO RESOURCE PROBLEMS IN SOUTH DAKOTA Semiannual Progress Report, 1 Jul. - 31 Dec. 1979
Victor I. Myers, Principal Investigator, R. G. Best, K. J. Dalsted, J. E. Eidenshink, R. Fowler, J. L. Heilman, and F. A. Schmer 31 Dec. 1979 122 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS
(Grant NGL-42-003-007)
(E80-10086; NASA-CR-162784; SDSU-RSI-80-02) Avail: NTIS HC A06/MF A01 CSCL 08F

There are no author-identified significant results in this report.

N80-19594# National Environmental Satellite Service, Washington, D. C.
NOAA SATELLITE MONITORING OF SNOW COVER IN THE NORTHERN HEMISPHERE DURING THE WINTER OF 1977
Donald R. Wiesnet, Michael Matson, and David F. McGinnis [1977] 18 p refs
Avail: NTIS HC A02/MF A01

Weekly snow and ice charts were used to prepare mean monthly data on snowcover for both North America and Eurasia. These data were then utilized to prepare simple regressions of antecedent snowcover vs. January, February, February and January-through March snowcover figures, demonstrating a number of statistically significant relationships for Eurasia and the Northern Hemisphere (land surface only). These relationships, despite the limited data sample (10 years of record), indicate that higher-than-average December snowcover tends to presage a winter of more-than-average snowcover. A.R.H.

N80-19595# Environmental Research and Technology, Inc., Concord, Mass.
COMPARATIVE STUDY OF ANOMALOUS GRAY-SHADE PATTERNS IN DMSP AND LANDSAT IMAGERY Final Report
James C. Barnes, C. James Bowley, Ronald G. Isaacs, and Allen J. Bussey Sep. 1979 105 p refs
(Contract N00228-77-C-3164)
(AD-A077902; ERT-P-3469; NEPRF-CR-79-05) Avail: NTIS HC A06/MF A01 CSCL 04/2

A comparative analysis of anomalous gray-shade patterns is performed using Defense Meteorological Satellite Program (DMSP) and LANDSAT multispectral imagery. Eight cases are analyzed where anomalous gray-shade patterns associated with reduced visibilities in light fog or haze are detected in DMSP imagery, and where corresponding LANDSAT data are available. In addition, a detailed theoretical analysis of the effects of water vapor absorption on the imagery is performed. The qualitative results of the imagery analysis indicate that within the anomalous gray-shade patterns as detected in the DMSP imagery, the LANDSAT MSS-4 (visible band) image will appear more hazy than the longer wavelength LANDSAT bands. The theoretical analysis indicates that simulated radiances from the DMSP are similar to the LANDSAT MSS-6 band, rather than to MSS-4. This apparent contradiction can be explained by considering the relative contributions of energy from the different spectral intervals comprising the total DMSP response rather than the response function alone; the different spatial resolutions of the DMSP and LANDSAT sensors may also be a factor. The results of the theoretical analysis further suggest that for realistic cases of high humidity and low visibility, it is the aerosol growth, not

the growth in water vapor, that increases the radiance measured by the DMSP Very High Resolution (VHR) sensor. GRA

N80-19596# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
LANDSAT MSS COORDINATE TRANSFORMATIONS
Berthold K. P. Horn and Robert J. Woodham Feb. 1978 56 p refs
(Contract N00014-75-C-0643)
(AD-A078418; AI-M-465) Avail: NTIS HC A04/MF A01 CSCL 14/5

A number of image analysis tasks require the registration of a surface model with an image. In the case of satellite images, the surface model may be a map or digital terrain model in the form of surface elevations on a grid of points. We develop here an affine transformation between coordinates of Multi-Spectral Scanner (MSS) images produced by the LANDSAT satellites, and coordinates of a system lying in a plane tangent to the Earth's surface near the sub-satellite (Nadir) point. GRA

N80-19597# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
PROTOTYPE OVERLAND FLOW TEST DATA: JUNE 1977 - MAY 1978
T. F. Jenkins, H. E. Hare, A. J. Palazzo, R. E. Bates, and C. J. Martel Nov. 1979 98 p refs
(AD-A078743; CRREL-SR-79-35) Avail: NTIS HC A05/MF A01 CSCL 13/2

A prototype overland flow land treatment system was operated at Hanover, New Hampshire, over a one-year cycle from June 1977 to May 1978. The individual data points collected over this period for water quantity and quality are presented as well as plant yields and nutrient uptake. The soil chemical and physical parameters measured are also presented along with a table of initial site characteristics. The meteorological measurements obtained in support of this effort are included to complete the data base. GRA

N80-19598# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
STATISTICAL ANALYSIS OF TERRAIN AND WATER (ICE) BACKGROUNDS IN A WINTER SCENE FROM NORTHERN MICHIGAN Final Report
Anthony J. LaRocca Oct. 1979 299 p refs
(Contract N60530-79-R-0036)
(AD-A077554; ERIM-139900-2-F) Avail: NTIS HC A13/MF A01 CSCL 17/5

Data from infrared imagery on various terrain and water (ice, in this instance) backgrounds were collected and analyzed to present their statistical features. This report describes some of the characteristics in the form of histograms, ellipse 'pictures', and power spectra for the following infrared spectral bands: 3.5-3.9, 4.5-5.5, and 9.0-11.4 micrometers. Areas were chosen to show variability of results in a winter scene with respect to different times of the day and night. GRA

N80-19599# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
STATISTICAL ANALYSIS OF TERRAIN AND WATER BACKGROUNDS IN THE VICINITY OF PORT HUENEME, CALIFORNIA
Anthony J. LaRocca Apr. 1979 156 p refs
(Contract N60530-78-C-0009)
(AD-A077025; ERIM-132300-3-T) Avail: NTIS HC A08/MF A01 CSCL 17/5

Data from infrared imagery on various terrain and water backgrounds have been collected by the Environmental Research Institute of Michigan and have been analyzed to present their statistical features. This work is being funded by the Optical Signatures Program to Support Navy Requirements. This report describes some of the characteristics in the form of histograms, ellipse 'pictures', and power spectra for the following infrared spectral bands: 2.0-2.6, 3.0-4.2, 4.5-5.5, and 9.0-11.4 microns. Special areas were chosen to demonstrate the variation in results with the selection of different backgrounds. GRA

N80-19600# Air Force Avionics Lab., Wright-Patterson AFB, Ohio.
TRI-BAR READING CORRECTION FOR OBLIQUE IMAGERY Final Report, Dec. 1978 - Jul. 1979
Edward L. Glaitti and Thomas Stanzione Jul. 1979 38 p refs
(AF Proj. 2004)
(AD-A076340; AFAL-TR-79-1171) Avail: NTIS HC A03/MF A01 CSCL 14/5

Tri-Bar resolution targets are geometrically distorted when photographed at oblique angles. One of the effects of this distortion is the changing of the aspect (length to width) ratio of the bars. Targets parallel to the line of flight (crossline) at large oblique angles to nadir of the aircraft produce images with apparent increased aspect ratios due to the foreshortening of the bar/space width. Perpendicular targets to the flight direction (inline) at an oblique angle have their lengths foreshortened, thus reducing the aspect ratios. At 70 deg, original 5:1 aspect ratio tri-bar targets have apparent ratios of 14.6:1 crossline and 1.71:1 inline. A laboratory experiment was set up to simulating oblique imagery to determine what effects the changing aspect ratio has on the accuracy of tri-bar readings, after the insertion of normal geometrical corrections. Different target contrast ratios, target orientations, and cameras were used. Analysis of variance showed that for crossline targets, resolution readings corrected by the normal cosine geometrical factor provide accurate results for any contrast ratio or target orientation. GRA

N80-19601# IBM Federal Systems Div., Gaithersburg, Md.
INTERACTIVE DIGITAL IMAGE PROCESSING INVESTIGATION Final Report
W. C. Rice, J. S. Shipman, and R. J. Spieler 29 Dec. 1978 185 p refs
(Contract DAAK70-77-C-0166)
(AD-A076342; ETL-0172) Avail: NTIS HC A09/MF A01 CSCL 05/8

The objective of this investigation was to develop an interactive software package of general utility that can be used to support experiments and evaluate a class of interactive/automatic digital techniques whose goal is feature extraction/exploitation. The initial task was to survey and select techniques, algorithms and supporting functions that were to be included in the system. A maximum likelihood supervised classification algorithm, and an unsupervised classification (clustering) method. These and the associated support and evaluation functions were developed and implemented on the Digital Image Analysis Laboratory. Testing of the system was accomplished by performing experiments on areas for which both multi-dimensional images and ground truth were available. Analysis of experimental results validated the system. These experimental results were in good agreement with ground truth and further, supervised and unsupervised classification results were in substantial agreement. This report describes the data processing algorithms/techniques, software system, user guide information, and the experiment procedures used along with their results. GRA

N80-19602# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
BRUNEAU KNOWN GEOTHERMAL RESOURCE AREA: AN ENVIRONMENTAL ANALYSIS
S. G. Spencer, ed. and B. F. Russell, ed. Sep. 1979 148 p refs
(Contract EY-76-C-07-1570)
(EGG-GTH-5004) Avail: NTIS HC A07/MF A01

This part of Owyhee County is the driest part of Idaho. The Bruneau known geothermal resource area (KGRA) is associated with the southern boundary fault zone of the Snake River Plain. Thermal water, produced from numerous artesian wells in the region, is supplied from two major aquifers. Ecological concerns include the threatened Astragalus mulfordiae and the numerous birds of prey nesting in the Snake River canyon northwest of the KGRA. Extensive geothermal development may strain the limited health care facilities in the county. Ethnographic information suggests that there is a high probability of prehistoric cultural materials being remnant in the Hot Spring locality. DOE

N80-19603# Wyoming Univ., Laramie. Dept. of Geology.
VIDEO PROCESSING OF REMOTE SENSOR DATA APPLIED TO URANIUM EXPLORATION IN WYOMING Final Report
Richard A. Levinson, Ronald W. Marrs, and Fred Crockett 30 Jun. 1979 223 p refs

(Contracts EY-76-C-13-1648; FI05-1)-1648)
(GJBX-171(79)) Avail: NTIS HC A10/MF A01

LANDSAT satellite imagery and aerial photography, used to map areas of altered sandstone associated with roll-front uranium deposits, must be enhanced so that alteration spectral contrasts can be seen. Video image processing is a fast, low-cost, and efficient tool. For LANDSAT data, the 7/4 ratio produces the best enhancement of altered sandstone. The 6/4 ratio is most effective for color infrared aerial photography. Samples from Pumpkin Buttes show that iron is the primary coloring agent which makes alteration visually detectable. Eh and pH changes associated with passage of a roll front cause oxidation of magnetic and pyrite to hematite, goethite, and limonite in the host sandstone, thereby producing the alteration. Statistical analysis show that the detectability of geochemical and color zonation in host sands is weakened by soil-forming processes. Alternation can only be mapped in areas of thin soil cover and moderate to sparse vegetative cover. DOE

N80-19604# System Development Corp., Santa Monica, Calif.
REGIONAL SYSTEMS DEVELOPMENT FOR GEOTHERMAL ENERGY RESOURCES. PACIFIC REGION: CALIFORNIA AND HAWAII. TASK 1: IMPLEMENTATION PLAN DEVELOPMENT
D. W. Michler 26 Mar. 1979 509 p refs
(Contract ET-78-C-03-1530)
(DOE/ET-28432-1) Avail: NTIS HC A22/MF A01

The utilization of geothermal energy resources for the generation of electrical power is considered as an alternative to fossil fuels or nuclear energy. The development of implementation plans for the commercialization of geothermal resources is described. The plans represent 21 reservoir-site developments and 48 geothermal power plant developments. Each plan consists of three integrated elements: (1) a bar-chart schedule that depicts interdependencies among activities and shows significant milestones on the path from initial exploration to power on-line; (2) task descriptions; and (3) the responsible performers of each task. A set of recommendations for the accelerated development of geothermal energy resources is given and the potential implementors are identified. J.M.S.

N80-19605# System Development Corp., Santa Monica, Calif.
REGIONAL SYSTEMS DEVELOPMENT FOR GEOTHERMAL ENERGY RESOURCES. PACIFIC REGION: CALIFORNIA AND HAWAII. TASK 2: REGIONAL PROGRAM MONITORING AND PROGRESS EVALUATION
19 Mar. 1979 132 p refs
(Contract ET-78-C-03-1530)
(DOE/ET-28432-2) Avail: NTIS HC A07/MF A01

The status of power plant projects is reported and major problems for each of the power plants are identified. Recommendations to alleviate these problems are outlined. J.M.S.

N80-19606# System Development Corp., Santa Monica, Calif.
REGIONAL SYSTEMS DEVELOPMENT FOR GEOTHERMAL ENERGY RESOURCES. PACIFIC REGION: CALIFORNIA AND HAWAII. TASK 3: WATER RESOURCES EVALUATION
J. L. Sakaguchi 19 Mar. 1979 375 p refs
(Contract ET-78-C-03-1530)
(DOE/ET-28432-3/1) Avail: NTIS HC A16/MF A01

The availability of surface and ground water for potential use as power plant make-up water in the major geothermal areas of California and Hawaii was assessed. The analysis concentrated on identifying the major sources of surface and ground water, potential limitations on the usage of this water, and the resulting constraints on potentially developable electrical power in each geothermal resource area. The water requirements for representative types of energy conversion processes were developed using a case study approach. Cooling water requirements for each type of energy conversion process were estimated based upon a specific existing or proposed type of geothermal power plant. The make-up water requirements for each type of conversion process at each resource location were then estimated as a basis for analyzing any constraints on the megawatts which potentially could be developed. DOE

N80-19607# System Development Corp., Santa Monica, Calif.
REGIONAL SYSTEMS DEVELOPMENT FOR GEOTHERMAL ENERGY RESOURCES. PACIFIC REGION: (CALIFORNIA AND HAWAII). TASK 3: WATER RESOURCES EVALUATION, APPENDICES
19 Mar. 1979 343 p refs
(Contract ET-78-C-03-1530)
(DOE/ET-28432-3/2) Avail: NTIS HC A15/MF A01

The appendices for the water resources evaluation report are included for the Imperial Valley KGRA's Coso, Mono-Long Valley, Geysers Calistoga, Surprise Valley, Wendell Amedee, Glass Mountain, Lassen, Puna, and for power plant case studies. DOE

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N80-19608 Pittsburgh Univ., Pa.
DEVELOPMENT OF A Fe-Pb(Ti) SECONDARY BATTERY SYSTEM Ph.D. Thesis
Raymond Thomas Galasco 1979 277 p
Avail: Univ. Microfilms Order No. 8004849

The Fe-Ti redox couple battery system was modified in order to enhance its discharge performance by alleviating the performance limiting kinetic effects in the anodic half cell. The most successful results were obtained when lead was used as a reducing agent added to the anolyte. This new battery system was described as the Fe-Pb(Ti) secondary battery system. Development and analysis of this battery system was performed. The results indicated lead oxidation in the anodic half cell was the major cause of battery performance enhancement during the early stages of discharge. Development of both stationary and flow batteries was undertaken. The effects of polarization on battery performance were investigated. Dissert. Abstr.

N80-19609*# Florida Univ., Gainesville. Dept. of Electrical Engineering.
STUDIES OF SILICON p-n JUNCTION SOLAR CELLS Final Technical Report, Sep. 1977 - Dec. 1979
A. Neugroschel and F. A. Lindholm Dec. 1979 177 p refs
(Grant NsG-3018)
(NASA-CR-162832) Avail: NTIS HC A09/MF A01 CSCL 10A

To provide theoretical support for investigating different ways to obtain high open-circuit voltages in p-n junction silicon solar cells, an analytical treatment of heavily doped transparent-emitter devices is presented that includes the effects of bandgap narrowing, Fermi-Dirac statistics, a doping concentration gradient, and a finite surface recombination velocity at the emitter surface. Topics covered include: (1) experimental determination of bandgap narrowing in the emitter of silicon p-n junction devices; (2) heavily doped transparent regions in junction solar cells, diodes, and transistors; (3) high-low-emitter solar cell; (4) determination of lifetimes and recombination currents in p-n junction solar cells; (5) MOS and oxide-charged-induced BSF solar cells; and (6) design of high efficiency solar cells for space and terrestrial applications. A.R.H.

N80-19610*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ORBITER FUEL CELL PERFORMANCE CONSTRAINTS. STS/OPS PRATT WHITNEY FUEL CELLS. OPERATING LIMITS FOR MISSION PLANNING
Harry E. Kolkhorst Feb. 1980 35 p
(NASA-TM-80958; Rept-79-FM-45; JSC-16255) Avail: NTIS HC A03/MF A01 CSCL 10A

The orbiter fuel cell powerplant (FCP) performance con-

straints listed in the Shuttle Operational Data Book (SODB) were analyzed using the shuttle environmental control requirements evaluation tool. The effects of FCP lifetime, coolant loops, and FCP voltage output were considered. Results indicate that the FCP limits defined in the SODB are not valid. K.L.

N80-19611*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
LSA FIELD TEST Annual Report, Aug. 1978 - Aug. 1979
Peter Jaffe 15 Dec. 1979 51 p
(Contract NAS7-100)
(NASA-CR-162798; JPL-Pub-80-5; DOE/JPL-1012-38) Avail: NTIS HC A04/MF A01 CSCL 10A

Degradation tests indicate that electrical degradation is not a slow monotonically increasing phenomenon as originally thought but occurs abruptly as the result of some traumatic event. This finding has led to a change in the test philosophy. A discussion of this change is presented along with a summary of degradation and failure data from all the sites and results from a variety of special tests. New instrumentation for in-field measurements are described. Field testing activity was expanded by the addition of twelve remote sites located as far away as Alaska and the Canal Zone. Descriptions of the new sites are included. R.E.S.

N80-19612*# Jay - Carter Enterprises, Inc., Burkburnett, Tex.
A 15 kWe (NOMINAL) SOLAR THERMAL-ELECTRIC POWER CONVERSION CONCEPT DEFINITION STUDY: STEAM RANKIN RECIPROCATOR SYSTEM Final Report
W. Wingenback and J. Carter, Jr. Jun. 1979 48 p refs
(Contracts DEN3-63; EX-76-A-29-1060)
(NASA-CR-159591; DOE/NASA/0063-79/1) Avail: NTIS HC A03/MF A01 CSCL 10A

A conceptual design of a 3600 rpm reciprocation expander was developed for maximum thermal input power of 80 kW. The conceptual design covered two engine configurations; a single cylinder design for simple cycle operation and a two cylinder design for reheat cycle operation. The reheat expender contains a high pressure cylinder and a low pressure cylinder with steam being reheated to the initial inlet temperature after expansion in the high pressure cylinder. Power generation is accomplished with a three-phase induction motor coupled directly to the expander and connected electrically to the public utility power grid. The expander, generator, water pump and control system weigh 297 kg and are dish mounted. The steam condenser, water tank and accessory pumps are ground based. Maximum heat engine efficiency is 33 percent: maximum power conversion efficiency is 30 percent. Total cost is $3,307 or $138 per kW of maximum output power. R.E.S.

N80-19613*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TEETERED, TIP-CONTROLLED ROTOR: PRELIMINARY TEST RESULTS FROM MOD-0 100-kW EXPERIMENTAL WIND TURBINE
J. C. Glasgow and D. R. Miller 1980 16 p refs Presented at Wind Energy Conf., Boulder, Colo., 9-11 Apr. 1980; sponsored by Am. Inst. of Aeron. and Astronautics and the Midwest Res. Inst.
(Contract EX-76-I-01-1028)
(NASA-TM-81445; DOE/NASA/1028-80/26; E-365) Avail: NTIS HC A02/MF A01 CSCL 10B

Results of tests conducted using the MOD-0 100 kW experimental wind turbine are evaluated. The teetered rotor significantly decreased loads on the yaw drive mechanism and reduced blade cyclic flapwise bending moments by 25 percent at the 20 percent span location when compared to the rigid hub rotor. The teetered hub performed well, but impacted the teeter stops on occasion as wind speed and/or direction varied rapidly. The tip-controlled rotor performed satisfactorily with some expected loss of control when compared to the full span pitchable blade. The performance results indicate that a review of techniques used to calculate rotor power is in order. K.L.

N80-19614*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INSTALLATION AND CHECKOUT OF THE DOE/NASA MOD-1 2000-kW WIND TURBINE GENERATOR
Richard L. Puthoff and John L. Collins 1980 25 p refs Presented at Wind Energy Conf., Boulder, Colo. 9-11 Apr. 1980; sponsored by Am. Inst. of Aeron. and Astronautics and the Midwest Res. Inst.
(Contract EX-77-A-29-1010)
(NASA-TM-81444; DOE/NASA/1010-80/6; E-364) Avail: NTIS HC A02/MF A01 CSCL 10B

The Mod-1 machine was assembled without the blades, tested, and sent to the site at Boone, North Carolina for erection. The blades were transported directly to the site. A series of checkout tests were then conducted to evaluate performance and loads. The results of these tests compared well with the design data. K.L.

N80-19615*# United Technologies Corp., South Windsor, Conn. Power Systems Div.
ADVANCED TECHNOLOGY LIGHT WEIGHT FUEL CELL PROGRAM Final Report, 28 Jul. 1978 - 28 Jul. 1979
R. E. Martin 1979 52 p refs
(Contract NAS3-21257)
(NASA-CR-159807; FCR-1657) Avail: NTIS HC A04/MF A01 CSCL 10B

The development of a long life, high performance, high efficiency, hydrogen oxygen alkaline fuel cell configuration for application to a NASA orbiting space vehicle is documented. Seven full-size 0.25 ft 2 active area single cells were constructed and tested at cell temperatures between 140 F and 200 F, current densities out to 500 ASF, and reactant pressures up to 30 psia. Cells incorporating platinum-supported-on-carbon catalyst anodes demonstrated 8,085 cell-hours of endurance operation with virtually no change in performance and 2,995 cell-hours of operation to a cyclical load profiles with no apparent loss in cathode performance due to high voltage operation. Cell edge frame materials and heat treated polybenzimidazole (PBI) matrix samples were corrosion tested in 42 wt % aqueous potassium hydroxide at 250 F. Based upon available test data, PBI appears unsuitable for use as a fuel cell matrix material. Five semiconducting oxides were evaluated as cathode catalysts and as cathode catalyst supports. The candidate supports LaMnO3 and LaNiO3 appear to have development potential and merit further study. K.L.

N80-19616*# Boeing Aerospace Co., Seattle, Wash.
SOLAR POWER SATELLITE SYSTEM DEFINITION STUDY. VOLUME 3: OPERATIONS AND SYSTEMS SYNTHESIS, PHASE 2 Final Report, Jan. - Nov. 1979
Nov. 1979 596 p refs 5 Vol.
(Contract NAS9-15636)
(NASA-CR-160480; D180-25461-3) Avail: NTIS HC A25/MF A01 CSCL 10A

The results of the operations analyses are reported. Some of these analyses examined operations aspects of space vehicle in-space maintenance. Many of the analyses explored in great depth operations concerned the LEO Base cargo handling operations. Personnel transportation operations and cargo packaging were also analyzed. These operations analyses were performed to define the operational requirements for all of the SPS system elements so that equipment and facilities could be synthesized, and to make estimates of the manpower requirements. An overall, integrated, end-to-end description of the SPS operations is presented. The detailed operations analyses, upon which this integrated description was based, are included. F.O.S.

N80-19617*# Dow Corning Corp., Midland, Mich.
DEVELOP SILICONE ENCAPSULATION SYSTEMS FOR TERRESTRIAL SILICON SOLAR ARRAYS Final Report
Dec. 1979 57 p Prepared for JPL and DOE
(Contract JPL-954995)
(NASA-CR-162840; DOE/JPL-954995-80/8) Avail: NTIS HC A04/MF A01 CSCL 10A

A cost effective encapsulant system was identified and a silicone acrylic cover material containing a durable ultraviolet screening agent was prepared. The effectiveness of the cover material in protecting photo-oxidatively sensitive polymers was demonstrated. K.L.

N80-19618*# Sensor Technology, Inc., Chatsworth, Calif.
AUTOMATED ARRAY ASSEMBLY TASK IN-DEPTH STUDY OF SILICON WAFER SURFACE TEXTURIZING Final Report,

31 Dec. 1978 - 31 Jul. 1979
Gregory T. Jones and Sang S. Rhee Jul. 1979 70 p refs Prepared for JPL and DOE
(Contract JPL-955266)
(NASA-CR-162883; DOE/JPL-955266-79/2) Avail: NTIS HC A04/MF A01 CSCL 10A

Several aspects of silicon wafer surface texturizing were studied. A low cost cleaning method that utilizes recycled Freon in an ultrasonic vapor degreaser to remove organic and inorganic contaminants from the surface of silicon wafers as received from silicon suppliers was investigated. The use of clean dry air and high throughout wafer batch drying techniques was shown to lower the cost of wafer drying. A two stage texturizing process was examined for suitability in large scale production. Also, an in-depth gettering study with the two stage texturizing process was performed for the enhancement of solar cell efficiency, minimization of current versus voltage curve dispersion, and improvement in process reproducability. The 10% efficiency improvement goal was exceeded for the near term implementation of flat plate photovoltaic cost reduction. R.E.S.

N80-19619*# Ross (Bernd) Associates, San Diego, Calif.
DEVELOPMENT OF ECONOMICAL IMPROVED THICK FILM SOLAR CELL CONTACT Final Report, Apr. - Dec. 1979
Bernd Ross Dec. 1979 107 p refs Prepared for JPL and DOE
(Contract JPL-955164)
(NASA-CR-162849; DOE/JPL-955164-79/4; JPL-9950-287) Avail: NTIS HC A06/MF A01 CSCL 10A

Metal screened electrodes were investigated with base metal pastes and silver systems being focused upon. Contact resistance measurements were refined. A facility allowing fixing in hydrogen and other atmospheres was acquired. Several experiments were made applying screenable pastes to solar cells. Doping investigations emphasized eutectic alloys reduced to powders. Metal systems were reviewed and base metal experiments were done with nickel and copper using lead and tin as the frit metals. Severe adhesion problems were experienced with hydrogen atmospheres in all metal systems. A two step firing schedule was devised. Aluminum-silicon and aluminum-germanium eutectic doping additions to copper pastes were tried on 2 1/4 in diameter solar cell back contacts, both with good results. R.E.S.

N80-19620*# SOL/LOS, Inc., Los Angeles, Calif.
A NEW METHOD OF METALLIZATION FOR SILICON SOLAR CELLS Final Report, Dec. 1978 - Sep. 1979
Milo Macha Dec. 1979 67 p Prepared for JPL and DOE
(Contract JPL-955318)
(NASA-CR-162823; DOE/JPL-955318-79/3; JPL-9950-288) Avail: NTIS HC A04/MF A01 CSCL 10A

The new metallization process based on Mo-Sn system was studied. The reaction mechanism of MoO3 and its mixture with Sn was examined. The basic ink composition was modified in order to obtain a low ohmic contact to the cell. The electrical characteristics of the cells were comparable with the existing metallization processes. However, in comparison with the standard processes using silver as the contacting metal, the saving obtained by the use of the new process was substantial. K.L.

N80-19621*# Sanders Associates, Inc., Nashua, N. H. Energy Systems Center.
HIGH TEMPERATURE SOLAR THERMAL RECEIVER Final Report
Dec. 1979 109 p Prepared for JPL and DOE
(Contract JPL-955454)
(NASA-CR-162831; JPL-9950-283) Avail: NTIS HC A06/MF A01 CSCL 10A

A design concept for a high temperature solar thermal receiver to operate at 3 atmospheres pressure and 2500 F outlet was developed. The performance and complexity of windowed matrix, tube-header, and extended surface receivers were evaluated. The windowed matrix receiver proved to offer substantial cost and performance benefits. An efficient and cost effective hardware design was evaluated for a receiver which can be readily interfaced to fuel and chemical processes or to heat engines for power generation. K.L.

N80-19622*# General Electric Co., Schenectady, N. Y.
LOW COST POINT FOCUS SOLAR CONCENTRATOR, PHASE 1: PRELIMINARY DESIGN Final Report
16 Mar. 1979 235 p Prepared for JPL
(Contract JPL-955210)
(JPL-9950-273; NASA-CR-162830) Avail: NTIS HC A11/MF A01 CSCL 10A

The preliminary design of a low cost point focus solar concentrator is presented. The analysis, design, testing, and manufacturing assessments are described. R.E.S.

N80-19623*# Varian Associates, Lexington, Mass.
SLICING OF SILICON INTO SHEET MATERIAL. SILICON SHEET GROWTH DEVELOPMENT FOR THE LARGE AREA SILICON SHEET TASK OF THE LOW COST SOLAR ARRAY PROJECT Final Report, 9 Jan. 1976 - 30 Sep. 1979
J. R. Fleming, S. C. Holden, and R. G. Wolfson 21 Sep. 1979 460 p Prepared for JPL and DOE
(Contracts NAS7-100; JPL-954374)
(NASA-CR-162828; DOE/JPL-954374-79/10; JPL-9950-272) Avail: NTIS HC A20/MF A01 CSCL 10A

The use of multiblade slurry sawing to produce silicon wafers from ingots was investigated. The commercially available state of the art process was improved by 20% in terms of area of silicon wafers produced from an ingot. The process was improved 34% on an experimental basis. Economic analyses presented show that further improvements are necessary to approach the desired wafer costs, mostly reduction in expendable materials costs. Tests which indicate that such reduction is possible are included, although demonstration of such reduction was not completed. A new, large capacity saw was designed and tested. Performance comparable with current equipment (in terms of number of wafers/cm) was demonstrated. R.E.S.

N80-19624*# Boeing Engineering and Construction, Seattle, Wash.
LOW COST POINT FOCUS SOLAR CONCENTRATOR, PHASE 1
Mar. 1979 181 p Prepared for JPL
(Contract JPL-995209)
(NASA-CR-162848; JPL-9950-279) Avail: NTIS HC A09/MF A01 CSCL 10A

Design concepts and plans for mass-production facilities and equipment, field installation, and maintenance were developed and used for cost analysis of a pneumatically stabilized plastic film point focus solar concentrator which has potential application in conjunction with Brayton cycle engines or supply of thermal energy. A sub-scale reflector was fabricated and optically tested by laser ray tracing to determine focal deviations of the surface slope and best focal plane. These test data were then used for comparisons with theoretical concentrator performance modeling and predictions of full-scale design performance. Results of the economic study indicate the concentrator design will have low cost when mass-produced and has cost/performance parameters that fall within current Jet Propulsion Laboratory goals. A.R.H.

N80-19625*# Acurex Corp., Mountain View, Calif. Alternate Energy Division.
LOW-COST POINT-FOCUS SOLAR CONCENTRATOR, PHASE 1 Final Report
E. V. Nelson, T. C. Derbidge, D. Erskine, R. A. Maraschin, W. A. Niemeyer, M. J. Matsushita, and P. T. Overly 16 Mar. 1979 260 p Prepared for JPL
(Contract JPL-955208)
(NASA-CR-162839; JPL-9550-28; Acurex-FR-79-340) Avail: NTIS HC A12/MF A01 CSCL 10A

The results of the preliminary design study for the low cost point focus solar concentrator (LCPFSC) development program are presented. A summary description of the preliminary design is given. The design philosophy used to achieve a cost effective design for mass production is described. The concentrator meets all design requirements specified and is based on practical design solutions in every possible way. R.E.S.

N80-19626*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COGENERATION TECHNOLOGY ALTERNATIVES STUDY (CTAS). VOLUME 1: SUMMARY

Gerald J. Barna, Raymond K. Burns, and Gary D. Sagerman
Jan. 1980 89 p
(Contract EC-77-A-31-1062)
(NASA-TM-81400; DOE/NASA/1062-80/4; E-312) Avail: NTIS HC A05/MF A01 CSCL 10B

Various advanced energy conversion systems that can use coal or coal-derived fuels for industrial cogeneration applications were compared to provide information needed by DOE to establish research and development funding priorities for advanced-technology systems that could significantly advance the use of coal or coal-derived fuels in industrial cogeneration. Steam turbines, diesel engines, open-cycle gas turbines, combined cycles, closed-cycle gas turbines, Stirling engines, phosphoric acid fuel cells, molten carbonate fuel cells, and thermionics were studied with technology advancements appropriate for the 1985-2000 time period. The various advanced systems were compared and evaluated for wide diversity of representative industrial plants on the basis of fuel energy savings, annual energy cost savings, emissions savings, and rate of return on investment as compared with purchasing electricity from a utility and providing process heat with an on-site boiler. Also included in the comparisons and evaluations are results extrapolated to the national level.
F.O.S.

N80-19627*# IBM Federal Systems Div., Huntsville, Ala.
SOLAR ENERGY SYSTEM PERFORMANCE EVALUATION: SEASONAL REPORT FOR SEMCO, LOXAHATCHEE, FLORIDA Contractor Report, Oct. 1978 - Aug. 1979
Jan. 1980 75 p refs Sponsored in part by DOE
(Contract NAS8-32036)
(NASA-CR-161379) Avail: NTIS HC A04/MF A01 CSCL 10A

The operational and thermal performance of a variety of solar systems installed in operational test sites are described. The analysis used is based on instrumented system data monitored and collected for at least one full season of operation. The long-term field performance of the installed system and the technical contributions to the definition of techniques and requirements solar energy system design are analyzed. The solar energy system was designed to supply domestic hot water for a family of four, single-family residences. It consists of two liquid flat plate collectors, single tank, controls, and transport lines.
F.O.S.

N80-19628*# Wyle Labs., Inc., Huntsville, Ala.
THERMAL PERFORMANCE EVALUATION OF THE NORTHROP MODEL NSC-01-0732 CONCENTRATING SOLAR COLLECTOR ARRAY AT OUTDOOR CONDITIONS
Dec. 1979 18 p Sponsored in part by DOE
(Contract NAS8-32036)
(NASA-CR-161354; WYLE-TR-531-39) Avail: NTIS HC A02/MF A01 CSCL 10A

The thermal efficiency of the concentrating, tracking solar collector was tested after ten months of operation at the Marshall Space Flight Center solar house. The test procedures and results are presented.
K.L.

N80-19629*# IBM Federal Systems Div., Huntsville, Ala.
SOLAR ENERGY SYSTEM PERFORMANCE EVALUATION: A SEASONAL REPORT FOR SEMCO, MACON, GEORGIA Contractor Report, May 1978 - Apr. 1979
Jan. 1980 72 p refs Sponsored in part by DOE
(Contract NAS8-32036)
(NASA-CR-161380) Avail: NTIS HC A04/MF A01 CSCL 10A

The solar energy system for heating water in a single-family residence for a family of four is described. The system operation, the operating energy, energy savings, maintenance, and performance are analyzed.
F.O.S.

N80-19630*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
INSTALLATION GUIDELINES FOR SOLAR HEATING SYSTEM, SINGLE-FAMILY RESIDENCE AT NEW CASTLE, PENNSYLVANIA
Jan. 1980 169 p Sponsored in part by DOE
(Contract NAS8-32093)
(NASA-CR-161355) Avail: NTIS HC A08/MF A01 CSCL 10A

The solar heating system installer guidelines are presented for each subsystem. This single family residential heating system is a solar-assisted, hydronic-to-warm-air system with solar-assisted domestic water heating. It is composed of the following major components: (1) liquid cooled flat plate collectors; (2) water storage tank; (3) passive solar-fired domestic water preheater; (4) electric hot water heater; (5) heat pump with electric backup; (6) solar hot water coil unit; (7) tube-and-shell heat exchanger, three pumps, and associated pipes and valving in an energy transport module; (8) control system; and (9) air-cooled heat purge unit. Information is provided on the operating procedures, controls, caution requirements, and routine and schedule maintenance in the form of written descriptions, schematics, detail drawings, pictures, and manufacturer's component data.
R.E.S.

N80-19631*# Boeing Aerospace Co., Seattle, Wash.
SOLAR POWER SATELLITE SYSTEM DEFINITION STUDY. VOLUME 1, PHASE 2: EXECUTIVE SUMMARY Final Report
Nov. 1979 36 p Revised
(Contract NAS8-15636)
(NASA-CR-160540; D180-25461-1-Vol-1-Rev-A) Avail: NTIS HC A03/MF A01 CSCL 10A

A review of solar energy conversion and utilization is presented. The solar power satellite system is then described. Overall system definition and integration is discussed. Principal reference system study accomplishments and conclusions are presented.
R.E.S.

N80-19632*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ANNUAL TECHNICAL REPORT, FISCAL YEAR 1979. VOLUME 1: EXECUTIVE SUMMARY Annual Report
John W. Lucas 15 Jan. 1980 46 p Sponsored in part by DOE
(Contract NAS7-100)
(NASA-CR-159715; JPL-Pub-79-112-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 10A

Accomplishments of the Point-Focusing Distributed Receiver Technology project are presented. The following aspects of the project are discussed: information dissemination, concentrator development, receiver and heat transport network development, power conversion, manufacturing, systems engineering, and tests and evaluations.
R.E.S.

N80-19633*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
GLASS FOR LOW-COST PHOTOVOLTAIC SOLAR ARRAYS
F. L. Bouquet 1 Feb. 1980 65 p refs Sponsored in part by DOE
(Contract NAS7-100)
(NASA-CR-162885; DOE/JPL-1012-40; JPL-Pub-80-12) Avail: NTIS HC A04/MF A01 CSCL 10A

Various aspects of glass encapsulation that are important for the designer of photovoltaic systems are discussed. Candidate glasses and available information defining the state of the art of glass encapsulation materials and processes for automated, high volume production of terrestrial photovoltaic devices and related applications are presented. The criteria for consideration of the glass encapsulation systems were based on the low-cost solar array project goals for arrays: (1) a low degradation rate, (2) high reliability, (3) an efficiency greater than 10 percent, (4) a total array price less than $500/kW, and (5) a production capacity of 500,000 kW/yr. The glass design areas discussed include the types of glass, sources and costs, physical properties, and glass modifications, such as antireflection coatings.
R.E.S.

N80-19634*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE EFFECTS OF REGIONAL INSOLATION DIFFERENCES UPON ADVANCED SOLAR THERMAL ELECTRIC POWER PLANT PERFORMANCE AND ENERGY COSTS
A. F. Latta, J. M. Bowyer, T. Fujita, and P. H. Richter 1 Feb. 1980 117 p refs Revised Sponsored in part by DOE
(Contract NAS7-100)
(NASA-CR-162886; JPL-Pub-79-39-Rev-1;

DOE/JPL-1060-17-Rev-1) Avail: NTIS HC A06/MF A01 CSCL 10A

The performance and cost of four 10 MWe advanced solar thermal electric power plants sited in various regions of the continental United States was studied. Each region has different insolation characteristics which result in varying collector field areas, plant performance, capital costs and energy costs. The regional variation in solar plant performance was assessed in relation to the expected rise in the future cost of residential and commercial electricity supplied by conventional utility power systems in the same regions. A discussion of the regional insolation data base is presented along with a description of the solar systems performance and costs. A range for the forecast cost of conventional electricity by region and nationally over the next several decades is given. R.E.S.

N80-19635# EIC, Inc., Newton, Mass.
INVESTIGATIONS OF THE SAFETY OF Li/SOCl2 BATTERIES Quarterly Report, 30 Mar. - 30 Jun. 1979
Kuzhikalail M. Abraham, Richard M. Mank, and Gerhard L. Holleck Nov. 1979 57 p refs
(Contract DAAG07-78-C-0564; DA Proj. 1L1-62705-AH-94) (AD-A077894; C-536-3; DELET-TR-78-0564-3; QR-3) Avail: NTIS HC A04/MF A01 CSCL 10/3

Analysis of products from Li/SOCl2 cells during various modes of operation was carried out using cyclic voltammetry and infrared spectrometry. Infrared spectral data indicated that LiAlSCl2 and probably LiAlS2 are formed in cathode limited Li/SOCl2 cells during forced overdischarge and resistive load overdischarge. These compounds are formed from the reaction of Li2S, produced in the cell under these operational modes, with LiAlCl4. It has been found that the lithium thioaluminum compounds can be prepared from the reaction between Li2S and AlCl3. Analysis of products from cells utilizing Li2O/AlCl3 based electrolytes did not show any significantly different products after overdischarge or constant current 'charge'. preliminary studies showed that Li2S/AlCl3 based electrolytes may be useful as alternatives to LiAlCl4 in Li/SOCl2 batteries. GRA

N80-19636# New Mexico Univ., Albuquerque. Eric H. Wang Civil Engineering Research Facility.
SURVIVABILITY OF REMOTE SITE ALTERNATE ENERGY SYSTEMS. VOLUME 1: SURVIVABILITY ANALYSIS Final Report, Sep. 1978 - Mar. 1979
Karl E. Scheuch and Glenn T. Baird Sep. 1979 82 p refs
(Contract F29601-76-C-0015; AF Proj. 2103)
(AD-A078118; AFESC/ESL-TR-79-21-Vol-1) Avail: NTIS HC A05/MF A01 CSCL 10/3

As a result of increasing fuel costs and decreasing reserves, the USAF is studying the possibility of providing power to remote sites by means of alternate energy sources. Remote sites are identified and categorized. Several alternate energy sources are examined with respect to reliability, maintainability, and survivability against natural and man-made threats. Energy storage devices are also studied, and a final decision matrix is developed which relates these findings. Author (GRA)

N80-19637# Massachusetts Inst. of Tech., Cambridge. Water Resources and Hydrodynamics Lab.
WAVE POWER EXTRACTION BY FLOATING BODIES
C. C. Mei and J. N. Newman Nov. 1979 27 p refs
(Contract N00014-76-C-0214)
(AD-A078058) Avail: NTIS HC A03/MF A01 CSCL 10/2

The linearized theory of water waves is reviewed in the context of wave-energy absorbers. A global analysis is outlined, leading to relatively simple expressions for the maximum energy absorption. Calculations are presented for the performance of Salter cam in two dimensions, and of a Cockerell raft in both two and three dimensions. Similar rates of optimum energy absorption are anticipated for other devices including the Kaimei ship and French air bag. Author (GRA)

N80-19638# Naval Coastal Systems Center, Panama City, Fla.
DATA ANALYSIS FOR OCEAN THERMAL ENERGY CONVERSION (OTEC)
Susan M. Tuovila Nov. 1979 36 p
(AD-A077908; NCSC-TM-271-79) Avail: NTIS HC A03/MF A01 CSCL 08/10

Ocean Thermal Energy Conversion (OTEC) is the concept for a system which will extract energy from the ocean by taking advantage of the sizable temperture difference between surface and bottom water in a tropical ocean. A fundamental part of an OTEC system is a large section of heat exchangers through which the energy transfer is made. It is crucial to keep the surface of these heat exchangers clean because fouling by organisms in sea water can cause deterioration of the heat transfer effectiveness. The Naval Coastal Systems Center (NCSC) investigated cleaning techniques that would effectively prevent fouling in metal tubes over a long period of time. The physical structure and cleaning systems of the OTEC assembly at Panama City, Florida have been described in several papers and will be dealt with only briefly here. This report will describe the computer driven control and data analysis system used in conjunction with the mechanical system. This will include explanations of the physical computer setup and its interaction with hardware components of the system, the software methods of sampling and data management, and data analysis techniques. A brief discussion of the underlying theory of heat transfer is also included. GRA

N80-19639# UOP, Inc., Des Plaines, Ill. Corporate Research Center.
OPTIMIZATION OF Pt-DOPED KOCITE (TRADE NAME) ELECTRODES IN H3Po4 FUEL CELLS Final Technical Report, Sep. 1978 - May 1979
L. B. Welsh and R. W. Leyerle Aug. 1979 74 p refs
(Contract DAAG53-76-C-0014; DA Proj. 1L1-62733-AH-20) (AD-A075372; TR-6) Avail: NTIS HC A04/MF A01 CSCL 09/1

The use of UOP Inc. Kocite (R*)-derived electrocatlysts as low-cost air and/or fuel electrocatalysts in phosphoric acid electrolyte fuel cells has been optimized with respect to some of the electrocatlyst and electrode structure parameters. Kocite-derived electrocatalysts are made from Kocite R* materials, which are composite structures consisting of pyropolymers chemically bonded to refractory substrates. Fuel cell electrodes are fabricated from these electrocatalysts and normally tested as anodes and cathodes in model fuel cells. Author (GRA)

N80-19640# Naval Civil Engineering Lab., Port Hueneme, Calif.
SOLAR-POWERED SUN TRACKER Final Report, Feb. 1977 - Sep. 1979
Carter J. Ward Jun. 1979 33 p refs
(ZF57571001)
(AD-A078653; CEL-TN-1556) Avail: NTIS HC A03/MF A01 CSCL 13/1

A solar-powered sun tracker believed to be capable of repositioning equipment to within 1 degree of the angle-of-incident radiation is described in this report. The proposed tracker is designed to reposition itself automatically after cloudy periods and should prove inexpensive as well as reliable. Included in this report are (1) a description of two tracker concepts, (2) a derivation of the heat-balance equation used to predict work available for equipment rotation, (3) a discussion of the experimental model fabricated to prove concept feasibility, and (4) an economic analysis comparing the cost of generating steam with a solar-powered boiler with the cost of generating steam with a coal-fired boiler. GRA

N80-19641# New Mexico Univ., Albuquerque. Center for Environmental Research and Development.
SOLAR POWERED LIQUID PISTON STIRLING CYCLE IRRIGATION PUMP Research Report, 1 May - 31 Dec. 1978
G. C. Bell 10 Apr. 1979 29 p refs
(Contract ET-78-G-03-1894)
(SAN/1894-1) Avail: NTIS HC A03/MF A01

A laboratory prototype of the liquid piston Stirling cycle heat engine was constructed with modeling and simulation. A range of engine sizes was used to determine lift head ranges. Preliminary investigations of solar energy inputs indicate numerous feasible methods to operate heat engines. The maximum rate of pumping obtained was one liter per 26 seconds through 109 cm lift head. DOE

N80-19642# San Diego State Univ., Calif.
RESEARCH ON DYNAMICS OF TUNDRA ECOSYSTEMS AND THEIR POTENTIAL RESPONSE TO ENERGY RESOURCE DEVELOPMENT Progress Report, 1 May 1978 30 Apr. 1979
P. C. Miller Jan. 1979 133 p refs
(Contract EE-77-S-03-1525)
(DOE/SF-01525-1) Avail: NTIS HC A07/MF A01

The ecological effects (costs and benefits) of impacts that can be expected from the development and utilization of energy resources in the arctic were investigated. The impacts studied include: altered nutrient availability (nitrogen and phosphorus); altered patterns of soil water drainage; and vehicle tracks. The general ecosystem characteristics used as integrative measures of the possible ecological effects include annual primary production and the relative aboveground growth of the different species or growth forms comprising the vegetation. Plant growth forms were defined by height, leaf longevity, position of the perennating bud, and rooting pattern. The main conclusion of the research is that species respond individually in terms of nutrient and total nonstructural carbohydrates accumulation to fertilization, and that the growth forms studied are not distinctive from each other on the basis of plant nutrition or growth. DOE

N80-19643# Sandia Labs., Albuquerque, N. Mex.
LITHIUM BATTERY STORAGE AND DISCHARGE TESTS
S. C. Levy 1979 10 p refs Presented at 7th Intern. Conf. on Chemical Vapor Deposition, Los Angeles, 14 Oct. 1979
(Contract EY-76-C-04-0789)
(SAND-79-0869C; CONF-791017-10) Avail: NTIS HC A02/MF A01

A six year storage and discharge test of ambient temperature lithium batteries was initiated. Lithium-sulfur dioxide cells from three manufacturers and lithium polycarbon monofluoride cells from a fourth manufacture were used. Capacity versus rate and temperature storage versus temperature and discharge at constant and pulsed loads were studied. Two problems were identified which will prevent cells from operating continuously for five years. They are: (1) corrosion of the glass in the glass-to-metal seal; and (2) corrosion of the anode-to-can contact. In addition, cells exposed to high temperature storage experienced corrosion of the aluminum to tantalum weld in the positive lead. DOE

N80-19644# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
MODELING THE SPACE CONDITIONING ENERGY DEMAND OF A COMMUNITY AS A FUNCTION OF WEATHER
E. R. Reiter, A. M. Starr, C. C. Burns, H. H. Leong, and G. R. Johnson Sep. 1979 16 p refs
(Contract EY-76-S-02-1340)
(COO-1340-65) Avail: NTIS HC A02/MF A01

The computer model which calculated the daily energy demand during the heating season of Greeley, Colorado, Cheyenne, Wyoming, and Minneapolis, Minnesota is discussed. The model was found to be excellently suited to test certain conservation strategies. However, preliminary tests of energy demands during the air conditioning season revealed gross inefficiency of some of the cooling systems presently in operation. DOE

N80-19645# Midwest Research Inst., Golden, Colo.
GENERAL RELIABILITY AND SAFETY METHODOLOGY AND ITS APPLICATION TO WIND ENERGY CONVERSION SYSTEMS
M. Edesess and R. D. McConnell Sep. 1979 52 p refs
(Contract EG-77-C-01-4042)
(SERI/TR-35-234) Avail: NTIS HC A04/MF A01

In conventional system reliability calculations, each component may be in the operable state of the under repair state. These calculations derive system unavailability, or the probability of the system's being down for repairs. By introducing a third component state between 'operable' and 'under repair'-namely, 'defective, but defect undetected'-the methods developed in this report enable system safety projections to be made in addition to availability projections. Also provided is a mechanism for computing the effect of inspection schedules on both safety and availability. A reliability and safety program (RASP) is detailed which perform these computations and also calculates costs for system inspections and repairs. RASP is applied to a simplified wind energy conversion system example. DOE

N80-19646# General Electric Co., Schenectady, N. Y.
SCREENING EVALUATION OF ELECTRIC POWER CYCLES INTEGRATED WITH COAL GASIFICATION PLANTS
S. P. Gallagher and D. J. Ahner Sep. 1979 80 p refs
(EPRI-AF-1160) Avail: NTIS HC A05/MF A01

Potentially lower cost alternatives to present concepts for integrated gasification combined cycle power plants were investigated. A relatively simple, potentially low cost, non steambottomed cycle was evolved and the system thermal efficiency calculated. Thermal efficiencies were also determined for several steam-bottomed cycles. The non steam-bottomed cycle was found to have a thermal efficiency of 32 percent. The steam-bottomed cycles analyzed in the study showed efficiency estimates between 38.8 and 40.3 percent, substantially higher than the non steam-bottomed case. The efficiency for an integrated gasification combined cycle using gas turbines at current firing temperatures was estimated at 37.6 percent. Performance at this level suggests the possibility that integrated gasification combined cycles using current gas turbines may be attractive for near term application. DOE

N80-19647# Institute for Energy Analysis, Oak Ridge, Tenn.
ENERGY ACCOUNTING FOR SOLAR AND ALTERNATIVE ENERGY SOURCES
Warren D. Devine, Jr. Jun. 1979 76 p refs
(Contracts EY-76-C-05-0033)
(ORAU/IEA(R)-79-11) Avail: NTIS HC A05/MF A01

Several inadequacies in present energy accounting practices are considered and an energy-accounting framework based upon the actual services provided to end users is proposed. Fifteen categories of energy service are described, and some of their characteristics are identified. The proposed energy accounting framework consists of two matrices - an energy-service matrix and an energy-carrier matrix. The energy-service matrix displays quantities of energy services provided in various ways as well as quantities of energy carriers used to provide energy services. The energy-carrier matrix displays quantities of energy carriers used to produce and distribute energy carriers to ultimate consumers. This accounting framework is illustrated with 1972 energy data for the United States, and several observations are made relative to long range solar energy research and development policy. DOE

N80-19648# Los Alamos Scientific Lab., N. Mex.
CHARACTERIZATION AND ASSESSMENT OF SELECTED SOLAR THERMAL ENERGY SYSTEMS FOR RESIDENTIAL AND PROCESS HEAT APPLICATIONS
J. C. Hyde Aug. 1979 55 p refs
(Contract W-7405-eng-36)
(LA-7995-TASE) Avail: NTIS HC A04/MF A01

The environmental data presented are in partial response to the Technology Assessment of Solar Energy (TASE) program, an assessment of the potential environmental, socioeconomic, and institutional impacts of solar technologies on the national, regional, and local community levels. The results of studies of seven solar thermal energy applications are presented. Five of these are residential applications and the remaining two applications produce industrial process heat. For each application, a representative system model and preliminary designs of major system elements were established. Then the following data were generated: annual useful energy produced, type and weight of the basic component materials, environmental residuals generated during system operation, and land and water requirements, the system characteristics and the environmental impacts are discussed. DOE

N80-19649# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ON INFLUENCING THE OPERATING TEMPERATURES OF MOTOROLA AND ARCO SOLAR PHOTOVOLTAIC MODULES
P. Raghuraman 11 Oct. 1979 30 p refs
(Contract EY-76-C-02-4094)
(COO-4094-59) Avail: NTIS HC A03/MF A01

The electrical power output of photovoltaic solar cell

modules decreases with increasing cell temperatures. Two such efforts on Motorola and Arco Solar modules are detailed using test measurements and analysis to increase the heat transfer from the modules and thereby lower the cell operating temperatures. The radiant heat emitted by the rear stainless steel pan of Motorola modules was increased by painting the pan with black and with white paint. This produced a pan temperature cooling of 3.7 C to 5 C, resulting in an increased electrical power output of 1.7 to 1.95 percent. Arco Solar modules were oriented horizontally and vertically to compare the effect of natural with forced convection cooling in the interior air column of the module. Natural convective heat transfer by vertical orientation produced a 1 to 3.5 C cooling over forced convective cooling by horizontal orientation. This cooling resulted in an increased cell electrical power output of 1 to 2.5 percent. DOE

N80-19650# Central Maine Power Co., Augusta.
CATARACT HYDROELECTRIC DEVELOPMENT EXPANSION STUDY
Jan. 1979 68 p refs Prepared in cooperation with Tippetts-Abbett-McCarthy-Stratton, New York, N.Y.
(Contract EW-78-F-07-1796)
(DOE/ID-01796-1) Avail: NTIS HC A04/MF A01

The Cataract hydroelectric power plant and dam was constructed in 1937-1938 and has been operated continually since that date. This unit is a vertical shaft Kaplan type machine with a rated output of 6650 kW at a design head of 44 ft. Maximum output is 8000 kW. The feasibility of expanding this existing plant was studied. The results indicate the following: the available head and unused flow at the Cataract Project will support an additional 6250 kW of generating capacity, the estimated gross plant investment cost of this plant would be $5,230,000 at present day costs. If a fishway is required the investment is estimated to be $5,730,000; and based on the analysis of 60 y of historical flow records this capacity addition would generate an average of 15,910,000 kWh annually. This feasibility study indicates that redevelopment of the Cataract site is a marginally economic proposition, which might offer some savings, over the life of the unit. DOE

N80-19651# Parsons-Brinckerhoff-Tudor-Bechtel, San Francisco, Calif.
POTENTIAL HYDROELECTRIC POWER, VERTICAL TURBINE, SPILLWAY COMBINE BROADWATER DAM Final Report
David C. Willer Apr. 1979 237 p
(Contract EW-78-F-07-1822)
(DOE/ID-01822-1) Avail: NTIS HC A11/MF A01

A feasibility study was made of the hydroelectric power potential at Broadwater Dam in western Montana. Two alternative configurations for the potential project were evaluated and the economics of four possible sources of project funding were assessed. The optimal project alternative was determined to be the apron-mounted configuration. The final choice of funding would be dependent on the power purchaser. It was shown that, regardless of the configuration or funding source selected, the project would be feasible. The cost of the apron-mounted configuration, which would consist of four turbine-generator units for a total installed capacity of 9.76 MW, was estimated as $13,250,000 with financing provided by either a PL-984 loan or tax-exempt bonds. The cost per installed kilowatt was therefore $1,350, and the cost per kilowatt-hour was 19.6 mills. The average annual energy was estimated to be 56.44 million kWh. DOE

N80-19652# Duke Univ., Durham, N. C. Dept. of Mechanical Engineering and Materials Science.
PREPARATION AND CHARACTERIZATION OF HYDROGENATED AMORPHOUS BORON THIN FILMS AND THIN FILM SOLAR CELLS PRODUCED BY GLOW DISCHARGE DECOMPOSITION METHODS Quarterly Progress Report, 1 Jul. - 30 Sep. 1979
Franklin H. Cocks, Phillip L. Jones, and Louis J. Dimmey Nov. 1979 12 p refs
(Contract DE-AC03-79ET-23041)
(DOE/ET-2304-1; QPR-3) Avail: NTIS HC A02/MF A01

The production and characterization of hydrogenated amorphous boron thin films is discussed. Both intrinsic and doped a-boron thin films were produced. Film characterization efforts are primarily focused on controlling the optical band gap by annealing the as-deposited films in vacuum at 400 C, and measuring the resulting optical gap as a function of bake-out time. Because the optical band gap of a-boron is observed to vary from 0.8 eV to over 2.0 eV as a function of hydrogenation, it should be possible, by controlled annealing, to obtain a-boron films with an optimal band gap of 1.45 eV. DOE

N80-19653# Boeing Aerospace Co., Seattle, Wash.
EMERGING MATERIALS SYSTEMS FOR SOLAR CELL APPLICATIONS-Cu/SUB 2-x/Se Quarterly Technical Progress Report, 1 Aug. - 1 Nov. 1979
R. A. Mickelsen, J. M. Stewart, W. S. Chen, and L. F. Buldhaupt Nov. 1979 16 p refs
(Contract DE-AC04-79ET-23005)
(DOE/ET-23005-T2; QTPR-2) Avail: NTIS HC A02/MF A01

The feasibility of using CU/sub 2-x/Se as a semiconductor material for the low cost production of photovoltaic solar cells was investigated. The Cu/sub 2-x/Se films was produced by coevaporation from individually monitored Cu and Se vapor sources. With a substrate temperature of 170 C, single phase cubic Cu/sub 2-x/Se films were produced. These films had a direct band gap of 2.2 eV and an indirect band gap of 1.4 eV. DOE

N80-19654# Brookhaven National Lab., Upton, N. Y.
ELECTROLYSIS-BASED HYDROGEN STORAGE SYSTEMS OVERVIEW AND RATIONALE OF THE BROOKHAVEN NATIONAL LABORATORY MANAGED PROGRAM
A. Mezzina 1979 5 p Presented at the DOE Chem. Energy Storage and Hydrogen Energy Systems Contracts Rev. Meeting, Reston, Va., 12 Nov. 1979
(Contract EY-76-C-02-0016)
(BNL-26904; CONF-791127-4) Avail: NTIS HC A02/MF A01

A technological base in chemical/hydrogen storage technology is developed and near-term opportunities for technology transfer are identified. The emphasis is on conversion of our inexhaustible resources in a cost effective manner. Budget allocations are summarized showing electrolytic hydrogen production as the highest priority area. A budget activity summary is also presented. DOE

N80-19655# Oklahoma Univ., Norman. Science and Public Policy Program.
ENERGY FROM THE WEST: IMPACT ANALYSIS REPORT. VOLUME 2: SITE-SPECIFIC AND REGIONAL IMPACT ANALYSES Final Report, Jul. 1975 - Oct. 1979
Irvin L. White, Michael A. Chartock, R. Leon Leonard, Steven C. Ballard, and Martha W. Gilliland Mar. 1979 991 p refs
(Contract EPA-68-01-1916)
(PB80-113574; EPA-600/7-79-082B) Avail: NTIS HC A99/MF A01 CSCL 10A

The results of impact analyses conducted as a part of a technology assessment of the development of six energy resources (coal, geothermal, natural gas, oil, oil shale and uranium) in eight western states (Arizona, Colorado, Montana, New Mexico, North Dakota, South Dakota, Utah and Wyoming) during the period 1975-2000 are presented. The likely impacts of deploying typical energy resource development technologies at sites representative of the kinds of conditions likely to be encountered are described. Local and regional impacts are discussed. GRA

N80-19656# National Technical Information Service, Springfield, Va.
CADMIUM SULFIDE SOLAR CELLS, VOLUME 1. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - 1977
Brian Carrigan Dec. 1979 256 p
(PB80-802218) Avail: NTIS HC $30.00/MF $30.00 CSCL 10B

Citations from Federally-funded research cover cadmium sulfide solar cell theory, design, development, fabrication, and degradation. Studies include junctions with thin films of copper sulfide, selenides, and tellurides. The performance, testing, analysis, efficiency, and costs of these cells are covered. This

updated bibliography contains 248 abstracts, none of which are new entries to the previous edition. GRA

N80-19657# National Technical Information Service, Springfield, Va.
SOLAR ELECTRIC POWER GENERATION, VOLUME 3. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, Oct. 1978 - Nov. 1979
Audrey S. Hundemann Dec. 1979 115 p Supersedes NTIS/PS-78/1109; NTIS/PS-77/0900; NTIS/PS-76/0797 (PB80-803034; NTIS/PS-78/1109; NTIS/PS-77/0900; NTIS/PS-76/0797) Avail: NTIS HC $30.00/MF $30.00 CSCL 10B

A worldwide literature survey cites power generation by direct conversion with solar cells and indirect conversion using solar heat. Topic areas cover solar tower power plants, orbital solar energy technology, photovoltaic power generation, and solar augmentation of hydroelectric power systems. A few abstracts pertain to the future role that solar energy will play in production of electric power and general studies comparing the technical and economic feasibility of various methods of electric power generation. Abstracts dealing with solar sea power generation and spacecraft power supplies are excluded. This updated bibliography contains 108 abstracts, all of which are new entries to the previous edition. GRA

N80-19658# National Technical Information Service, Springfield, Va.
SOLAR ELECTRIC POWER GENERATION, VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1976 - Sep. 1978
Audrey S. Hundemann Dec. 1979 235 p
(PB80-803000) Avail: NTIS HC $30.00/MF $30.00 CSCL 10B

Citations of Federally-funded research are presented pertaining to electric power generation by both direct conversion with solar cells and indirect conversion using solar heat. Topic areas cover equipment design, site surveys, economics, and feasibility studies of solar power satellite systems, photovoltaic systems, solar total energy systems, and central receiver solar thermal power systems. A few abstracts deal with phase change materials and thermal energy storage systems. This updated bibliography contains 228 abstracts, none of which is new to the previous edition. GRA

N80-19659# National Technical Information Service, Springfield, Va.
SOLAR ELECTRIC POWER GENERATION, VOLUME 3. CITATIONS FROM THE NTIS DATA BASE Progress Report, Oct. 1978 - Nov. 1979
Audrey S. Hundemann Dec. 1979 141 p Supersedes NTIS/PS-78/1108; NTIS/PS-77/0898; NTIS/PS-76/0796; NTIS/PS-75/691; NTIS/PS-75/346 (PB80-803018; NTIS/PS-78/1108; NTIS/PS-77/0898; NTIS/PS-76/0796; NTIS/PS-75/691; NTIS/PS-75/346) Avail: NTIS HC $30.00/MF $30.00 CSCL 10B

Equipment design, site surveys, economics, and feasibility studies of solar power satellite systems, photovoltaic systems, solar total energy systems, and central receiver solar thermal power systems are discussed in the 134 Federally-sponsored research reports cited in this updated bibliography. All entries are new to the previous edition. GRA

N80-19660# National Technical Information Service, Springfield, Va.
SOLAR ELECTRIC POWER GENERATION, VOLUME 2. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1976 - Sep. 1978
Audrey S. Hundemann Dec. 1979 253 p
(PB80-803026) Avail: NTIS HC $30.00/MF $30.00 CSCL 10B

Solar tower power plants, orbital solar energy technology, photovoltaic power generation, and solar augmentation of hydroelectric power systems are discussed in citations of worldwide reports. The technical and economic feasibility of various methods of electric power generation is also considered. This updated bibliography which contains 246 abstracts. None of the entries is new to the previous edition. GRA

N80-19661# National Technical Information Service, Springfield, Va.
SOLAR SEA POWER PLANTS. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Nov. 1979
Audrey S. Hundemann Dec. 1979 314 p Supersedes NTIS/PS-78/1223; NTIS/PS-77/1056; NTIS/PS-76/0901 (PB80-802580; NTIS/PS-78/1223; NTIS/PS-77/1056; NTIS/PS-76/0901) Avail: NTIS HC $30.00/MF $30.00 CSCL 10B

Federally-funded research studies dealing with the technical and economic feasibility of solar sea power plants are discussed. Topic areas cover condenser, evaporator, and heat exchanger design, and fouling and corrosion prevention. Site selection, dynamic modeling studies, and general studies dealing with solar sea power as an energy alternative are included. This updated bibliography contains 307 abstracts, 97 of which are new entries to the previous edition. GRA

N80-19662# National Technical Information Service, Springfield, Va.
SOLAR SEAPOWER PLANTS. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Nov. 1979
Audrey S. Hundemann Dec. 1979 257 p Supersedes NTIS/PS-78/1224; NTIS/PS-77/1057; NTIS/PS-76/0902 (PB80-802598; NTIS/PS-78/1224; NTIS/PS-77/1057; NTIS/PS-76/0902) Avail: NTIS HC $30.00/MF $30.00 CSCL 10B

The present status and future prospects of using the ocean thermal gradient for production of electric power are discussed in these citations from worldwide research. Engineering, economic, and feasibility studies are covered, including studies dealing with systems and component design. This updated bibliography contains 250 abstracts, 126 of which are new entries to the previous edition. GRA

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N80-19663*# Orion Research, Inc., Cambridge, Mass.
WATER QUALITY MONITOR Final Report
Steven West, John Crisos, and Wilfred Baxter Mar. 1979 119 p refs Original contains color illustrations
(Contract NAS9-14229)
(NASA-CR-160412) Avail: NTIS HC A06/MF A01 CSCL 13B

The preprototype water quality monitor (WQM) subsystem was designed based on a breadboard monitor for pH, specific conductance, and total organic carbon (TOC). The breadboard equipment demonstrated the feasibility of continuous on-line analysis of potable water for a spacecraft. The WQM subsystem incorporated these breadboard features and, in addition, measures ammonia and includes a failure detection system. The sample, reagent, and standard solutions are delivered to the WQM sensing manifold where chemical operations and measurements are performed using flow through sensors for conductance, pH, TOC, and NH3. Fault monitoring flow detection is also accomplished in this manifold assembly. The WQM is designed to operate automatically using a hardwired electronic controller. In addition, automatic shutdown is incorporated which is keyed to four flow sensors strategically located within the fluid system. K.L.

N80-19664*# National Aeronautics and Space Admir.istration. Langley Research Center, Langley Station, Va.
AUTOMATED SYRINGE SAMPLER Patent Application
Gerald C. Purgold, inventor (to NASA) Filed 11 Jan. 1980 16 p
(NASA-Case-LAR-12308-1; US-Patent-Appl-SN-111438) Avail: NTIS HC A02/MF A01 CSCL 13B

The invention is housed within a housing and positionable within a test fluid medium where a pump causes continuous test fluid flow therethrough via inlet filters and a conduit. A plurality of sampling devices are disposed on a rack slidably received in the housing and are responsive to a remote signal

received through an antenna to a receiver to activate circuitry elements. When activated the circuitry provides power individually, collectively or selectively to servomechanisms thereby moving the actuator arm and its attached jawed bracket supporting an evacuated tube toward stationary needle. The septum is punctured by the open end of the needle contained within the protective sleeve and a sample of the fluid test medium in the conduit flows through the needle and is transferred to the tube. NASA

N80-19665# Science Spectrum, Santa Barbara, Calif.
A BIOLOGICAL WASTE WATER MONITOR STUDY USING DIFFERENTIAL LASER LIGHT SCATTERING FROM BACTERIA Final Report 15 Aug. 1978 - 14 Aug. 1979
Philip J. Wyatt Oct. 1979 41 p refs
(Contract F49620-78-C-0096; AF Proj. 2312)
(AD-A078527; SSI-2015-F; AFOSR-79-1278TR) Avail: NTIS HC A03/MF A01 CSCL 06/20

A ninety-minute bioassay of selected toxicants (monomethylhydrazine, dimethylhydrazine, nitrosodimethylamine, JP4, and JPB) in water has been confirmed. The method consists of measuring the differential light scattering (DLS) patterns of exponential phase bacterial suspensions in water containing the selected toxicant relative to a toxicant-free control suspension. The suspensions are illuminated by a fine laser beam and the light scattered as a function of angle with respect to the incident beam is recorded (the DLS pattern). Relative to the bacteria in the control, toxicant-free, suspension bacteria affected by the toxicants may change their shape, average size, size distribution, and/or number density. Any such changes will in general result in a changed DLS pattern relative to that of the control. The measurement of such differences forms the basis for the present bioassay technique. The bacterial suspensions are usually prepared from a bacterial chemostat source driven by peristaltic pumps of a Technicon manifold. Throughout an 8 hour sampling period, cultures will generally not vary by more than 20% in number density and negligibly in morphology. Within the ninety minute assay period, number density variations are less than 5%. GRA

N80-19666# Battelle Pacific Northwest Labs., Richland, Wash.
ALASKAN ENVIRONMENTAL RESEARCH. SECTION 12.0 OF PART 2: ECOLOGICAL SCIENCES Annual Report, 1978
W. C. Hanson and L. E. Eberhardt Jul. 1979 31 p refs
(Contract EY-76-C-06-1830)
(PNL-2850-Pt-2-Suppl) Avail: NTIS HC A03/MF A01

Ecological consequences of resource developments in northern Alaska were investigated. Qualitative and quantitative results that describe environmental costs incurred by petroleum resource extraction and transportation, including interaction of industrial activities with arctic foxes (Alopex lagopus), small mammals, and tundra-nesting birds in the Prudhoe Bay field and along the Trans-Alaska pipeline and haul road are presented. Similar information from the Colville River delta, baseline information on moose (Alces alces) populations, caribou (Rangifer tarandus) range quality and use, and lichen communities that are or will be impacted by resource developments is included. Field experiments to determine lichen sensitivities to sulfur oxide concentrations likely to be encountered near pipeline pumping stations; food chain transfer of stable and radioactive elements that utilize a data base of some 19 years for comparative purposes; and evaluation of oil field development activities on rabies and other physiological phenomena in foxes are described. DOE

N80-19667# Battelle Pacific Northwest Labs., Richland, Wash.
MATHEMATICAL MODELS FOR ATMOSPHERIC POLLUTANTS. APPENDIX B: CHEMICAL AND PHYSICAL PROPERTIES OF GASES AND AEROSOLS Final Report
R. L. Drake, J. M. Hales, J. Mishima, and D. R. Drewes Aug. 1979 82 p refs
(Contract EY-76-C-06-1830)
(EPRI-EA-1131-App-B) Avail: NTIS HC A05/MF A01

Some of the important chemical and physical properties of gases and aerosols are described. These properties are required to determine the fate of airborne pollutants. The following chemical elements are discussed: hydrogen, oxygen, nitrogen, sulfur, and carbon. The tropospheric aerosol is considered from the point of view of an evolving population of particles. Particle and population properties are described, and examples of atmospheric aerosol distributions are presented. Finally, the sources and properties of airborne radionuclides from light-water reactors are discussed. DOE

N80-19668# Argonne National Lab., Ill.
ENVIRONMENTAL AND ECONOMIC EVALUATIONS OF ENERGY RECOVERY FROM AGRICULTURAL AND FORESTRY RESIDUES
Jerome P. Harper, Antonios A. Antonopoulos, and Andrew A. Sobek Aug. 1979 113 p refs
(Contract W-31-109-eng-38)
(ANL/EES/TM-58) Avail: NTIS HC A06/MF A01

Six biomass energy production model systems involving four conversion methods and five residues are described: hydrolysis of corn residues, pyrolysis of corn residues, combustion of cotton-ginning residues, pyrolysis of wheat residues, fermentation of molasses, and combustion of pulp and papermill wastes. Estimates of material and energy flows for those systems are given per 10 to the 12th power Btu of recovered energy. Regionalization of the model systems to the primary production region for the crop from which the residue is obtained was undertaken. The associated environmental consequences of residue utilization were then assessed for the production region. The environmental impacts of operating the model systems are examined. On the basis of estimates found in the literature, capital, operating, and maintenance cost estimates are given for the model systems. The study indicates that the most serious environmental impacts arise from residue removal rather than from conversion. DOE

N80-19669# Atlantic Research Corp., Alexandria, Va.
EVALUATION OF METHODOLOGY AND PROTOTYPE TO MEASURE ATMOSPHERIC SULFURIC ACID Final Report, Sep. 1976 - Nov. 1978
R. E. Snyder, M. E. Tonkin, and A. M. McKissick Aug. 1979 172 p refs
(Contract EPA-68-02-2467)
(PB80-107055; EPA-600/2-79-168) Avail: NTIS HC A08/MF A01 CSCL 13B

A method was developed to selectively assay ambient sulfuric acid aerosol. The method uses the vapor of a volatile amine (or amine derivative) to neutralize the acid as it is collected on a Teflon filter. The amine sulfate thus formed is thermally decomposed at 200 C to release sulfur dioxide, or other stoichiometrically related sulfur containing adducts, which are measured by a flame photometric detector. Immediate chemical fixation of the acid lessens the chance of side reactions with other substances on the filter, while the relatively low decomposition temperature aids in eliminating other sulfur-containing particles. Sulfur dioxide is also collected as a reagent complex on the filter, but is selectively removed by heating at 100 C. GRA

N80-19670# AeroChem Research Labs., Inc., Princeton, N. J.
MOBILE SOURCE NOx MONITOR, HYDROGEN-ATOM DIRECT CHEMILUMINESCENCE METHOD Final Report, Sep. 1977 - Mar. 1979
William R. Frenchu, Hermann N. Volltrauer, and William R. Frenchu Jul. 1979 43 p refs
(Contract EPA-68-02-2744)
(PB80-102759; EPA-600/2-79-120) Avail: NTIS HC A03/MF A01 CSCL 14B

An analyzer was developed for measuring motor vehicle NOx emission based on the chemiluminescence reaction of NO and NO2 with hydrogen atoms. This eliminates the need for an NO2 to NO converter as required with ozone chemiluminescence for NOx analysis. The hydrogen atom source is based on the thermal dissociation of molecular hydrogen on a hot tungsten filament. The unit has linear response to NOx over a concentration range from 4 ppm to greater than 3000 ppm. No interferences were observed with H2O, CO, CO2, toluene, isopentane, NH3, HCN, CH3NH2, or H2 at concentrations encountered in raw automobile exhaust. Oxygen and ethylene caused minor interferences which should be inconsequential in actual application. GRA

N80-19671# Southern Research Inst., Birmingham, Ala.
ELECTROSTATIC PRECIPITATIONS FOR COLLECTION OF

HIGH RESISTIVITY ASH Final Report, Nov. 1978 - Jan. 1979

D. H. Pontius, P. V. Bush, and W. B. Smith Aug. 1979 189 p refs

(Contract EPA-68-02-2193)

(PB80-112386; EPA-600/7-79-189) Avail: NTIS HC A09/MF A01 CSCL 13B

An investigation of electrode designs and methods for overcoming back corona was carried out, with the objective of developing a two stage electrostatic precipitator system capable of collecting high resistivity dusts with greater efficiency than can be achieved by conventional precipitators. Several alternative approaches were subjected to limited theoretical and experimental studies. Among the ideas considered were heated passive electrodes, a novel technique for injecting liquid or gaseous chemical reagents directly into the active corona region and various electrode geometries and energization schemes. The most promising approach appeared to be a three electrode geometry in which a screen electrode is used to trap ions originating from a back corona discharge, thus preventing those ions from interfering in the particle charging process. J.M.S.

N80-19672# Southern Research Inst., Birmingham, Ala.

ANALYSIS OF THERMAL DECOMPOSITION PRODUCTS OF FLUE GAS CONDITIONING AGENTS Final Report, 7 Jan. 1977 - 31 Mar. 1979

R. B. Spafford, E. B. Dismukes, and H. K. Dillon Aug. 1979 117 p refs

(Contract EPA-68-02-2200; Proj. 3832-27)

(PB80-111818; SORI-EAS-79-267; EPA-600/7-79-179) Avail: NTIS HC A06/MF A01 CSCL 13B

The reactions of several flue gas conditioning agents in a laboratory-scale facility simulating conditions in the flue gas train of a coal-burning power plant were studied. The compounds investigated were sulfur trioxide, ammonia, triethylamine, sodium carbonate, ammonium sulfate, and diammonium hydrogen phosphate. The predominant types of reactions observed in these experiments were thermal decomposition at high temperatures, recombination of decomposition fragments at lower temperatures, and reactions with normal components of the flue gas. The only significant environmental threat of any product identified was the formation of N-nitrosodiethylamine as the result of injecting triethylamine into the flue gas. This potent carcinogen was found in trace amounts when triethylamine was injected at 160 C. GRA

N80-19673# PEDCo-Environmental, Inc., Cincinnati, Ohio.

DEVELOPMENT OF AN EMISSION INVENTORY QUALITY ASSURANCE PROGRAM Final Report

David W. Armentrout Jun. 1979 58 p

(Contract EPA-68-02-2585)

(PB80-112345; EPA-450/4-79-006) Avail: NTIS HC A04/MF A01 CSCL 13B

Quality assurance is discussed both in general and in relation to emission inventories. Procedural elements of the inventory process are discussed along with typical error types and remedies. An approach is suggested for developing a quality assurance program for emission inventories. GRA

N80-19674# Harvard School of Public Health, Boston, Mass.

SETTING PRIORITIES FOR CONTROL OF FUGITIVE PARTICULATE EMISSIONS FROM OPEN SOURCES Final Report, Sep. 1977 - May 1979

D. W. Cooper, J. S. Sullivan, Margaret Quinn, R. C. Antonelli, and Maria Schneider Aug. 1979 136 p refs

(Grant EPA-R-805294)

(PB80-108962; EPA-600/7-79-186) Avail: NTIS HC A07/MF A01 CSCL 13B

Emission rates of suspended particles from open sources in the U.S. were estimated in order to set priorities for controlling fugitive particulate emissions. The major sources include unpaved roads, construction activities, wind erosion of cropland, paved roads, wildfires, and agricultural tilling. The control of unpaved road emissions (generally by paving), especially in cities, and the control of emissions from construction activities are concluded to deserve high priority in the effort to reduce total suspended particulate levels. K.L.

N80-19675# Environmental Research and Technology, Inc., Westlake Village, Calif.

USER'S GUIDE TO THE ELSTAR PHOTOCHEMICAL AIR QUALITY SIMULATION MODEL Progress Report, Apr. 1978 - Jun. 1979

Fred Lurmann Sep. 1979 506 p refs Sponsored by the Coordinating Res. Council, Inc., Atlanta

(PB80-109184; ERT-P-5287-600; NTIS/DF-79/001A) Avail: NTIS HC A22/MF A01 CSCL 13B

The ELSTAR model consists of a series of computer programs used to predict atmospheric concentrations of photochemical pollutants such as ozone, nitrogen dioxide and sulfates in a Lagrangian reference frame. The model includes the effects of meteorological transport, turbulent eddy diffusion, source emissions and chemical kinetic reactions. This manual describes the general structure and operational capabilities of the ELSTAR model. Detailed instruction are provided for input data specification and code operation to assist prospective users of the model. GRA

N80-19676# Environmental Protection Agency, Research Triangle Park, N.C.

AN EMPIRICAL APPROACH FOR RELATING ANNUAL TSP CONCENTRATIONS TO PARTICULATE MICROINVENTORY EMISSIONS DATA AND MONITOR SITING CHARACTERISTICS Final Report

Thompson G. Pace Jun. 1979 57 p refs

(PB80-113756; EPA-450/4-79-012) Avail: NTIS HC A04/MF A01 CSCL 13B

An empirical approach in which monitor siting characteristics and microinventory information are related to measured annual mean total suspended particulates (TSP) concentrations using multiple regression analysis was developed. The regression uses variables which consider the emissions and distances to both point and area sources and the effects of traffic and dust on nearby streets upon measured TSP concentrations. The methodology used in compilation of a microinventory is described. Procedures for developing and applying the empirical procedure are also described. GRA

N80-19677# Energy and Environmental Analysis, Inc., Arlington, Va.

SOURCES OF ATMOSPHERIC CADMIUM Final Report

Robert Coleman Aug. 1979 116 p refs

(Contract EPA-68-02-2836)

(PB80-121221; EPA-450/5-79-006) Avail: NTIS HC A06/MF A01 CSCL 13B

The used sources of cadmium and potential emission sources were were surveyed to determine which sources were the most significant both in terms of total emissions and potential ambient levels. It was estimated that about 850 tons of cadmium were emitted during 1974, with the largest estimated emitted during 1974, with the largest estimated emitted of cadmium being the production of zinc. Other sources identified were incinerators, iron and steel mills, fossil fuel combustion, smelters. GRA

N80-19678# Land-Air, Inc., Bethesda, Md. Applied Research Div.

ENGINEERING EVALUATION OF CONTROL TECHNOLOGY FOR H-COAL AND EXXON DONOR SOLVENT PROCESSES Final Report, Jan. 1977 - Mar. 1979

K. R. Sarna and D. T. Oleary Jul. 1979 125 p refs

(Contract EPA-68-02-2601)

(PB80-108566; EPA-600/7-79-168) Avail: NTIS HC A06/MF A01 CSCL 13B

The results of an evaluation of the control technology of two coal liquefaction processes, H-Coal and Exxon Donor Solvent, are presented. The effluent streams were characterized and quantified for both processes and plants (pilot and conceptualized commercial). The gaseous, liquid, and solid stream emissions were analyzed for their controllability, process complexity, and efficiency. Extrapolations to the larger commercial size were based partly on pilot plant data and (where such data was unavailable) engineering judgment. Several information gaps were encountered for liquid and solid effluent streams, especially as to composition. These deficiencies were pointed out and recommendations were outlined. GRA

N80-19679# Pacific Northwest Environmental Research Lab., Corvallis, Oreg. Freshwater Div.
NON-POINT SOURCE - STREAM NUTRIENT LEVEL RELATIONSHIPS: A NATIONWIDE STUDY. SUPPLEMENT 1: NUTRIENT MAP RELIABILITY Final Report
Theodore R. McDowell and James M. Omernik Sep. 1979 38 p refs Supplement to EPA-600/3-77-105
(PB80-112691; EPA-600/3-79-103) Avail: NTIS HC A03/MF A01 CSCL 13B

The national eutrophication survey (NES) maps of non-point source nitrogen and phosphorus concentrations in streams were evaluated for applicability and reliability. Interpretations on these maps which were based on data from 928 sampling sites associated with non-point source watersheds and the relationships of these data to general land use, and other macro-watershed characteristics, were compared with a nationwide set of non-point source stream nutrient data collected largely by the U.S. Geological Survey (USGS). In most areas where comparison could be made the mapped interpretations agreed relatively well with USGS data. Revised reliability map insets based on these analyses are provided for maps of total nitrogen and total phosphorus concentrations. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N80-19680 British Library Lending Div., Boston Spa (England).
SOLVING THE NON-LINEAR EQUATIONS OF DEEP CONVECTION
Ye. M. Pekelis 4 Jun. 1979 22 p refs Transl. into ENGLISH from Gidromet. Nauch. - Issled. Tsent. SSSR, T. Vyp. (USSR), v. 189, 1978 p 41-59 In ENGLISH and RUSSIAN
(BLL-Trans-1397-(9022.549)) Avail: British Library Lending Div., Boston Spa, Engl.

Starting with deep convection equations which describe mesoscale disturbances of the free atmosphere, laminar motion in a channel is considered for the case when the lower boundary is being deformed in an arbitrary fashion over a limited range. Finite defference solutions are used to find approximations of the horizontal and vertical velocities. F.O.S.

N80-19681 British Library Lending Div., Boston Spa (England).
POSSIBILITIES OF USING RADIATION IN THE OXYGEN ABSORPTION LINE AT LAMBDA = 2.53 mm ON SLANT PATHS FOR THERMAL SOUNDING OF THE ATMOSPHERE
Yu M. Timofeyev and M. I. Trifonov 11 Jun. 1979 10 p refs Transl. into ENGLISH from Gosuparst Univ., Probl. Atmos. Phys., Coll. 15 (Leningrad), 1978 p 65-76
(BLL-Trans-1402-(9022.549)) Avail: British Library Lending Div., Boston Spa, Engl.

The possibility of using measurements of outgoing radiation along slant paths at the oxygen absorption lines for lambda equals 2.53 mm is analyzed for solving the problem of thermal sounding the atmosphere. The choice of this particular absorption line, based upon the Zeeman effect and the use of instruments of high angular resolution, is discussed. Calculations of outgoing atmospheric radiation and its variation are analyzed. Atmospheric models for examining the functional relationships between radiation and the atmospheric parameters are described. The integral form of the equation of transport for outgoing radiation along a slant direction in a spherically symmetrical atmosphere served as the basis for applying the various models. A.W.H.

N80-19682*# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
CORONAL MAGNETIC STRUCTURE AND THE LATITUDE AND LONGITUDE DISTRIBUTION OF ENERGETIC PARTICLES, 1-5 AU Final Report, 15 Oct. 1978 - 15 Oct. 1979
E. C. Roelof and D. G. Mitchell 31 Oct. 1979 17 p refs
(Contract NAS8-33106)
(NASA-CR-161391) Avail: NTIS HC A02/MF A01 CSCL 04A

The relation of the coronal magnetic field structure to the distribution of approximately 1 MeV protons in interplanetary space between 1 and 5 AU is discussed. After ordering the interplanetary data by its estimated coronal emission source location in heliographic coordinates, the multispacecraft measured proton fluxes are compared with coronal magnetic field structure infrared as observed in soft X-ray photographs and potential field calculations. Evidence for the propagation and possible acceleration of solar flare protons on high magnetic loop structure in the corona is presented. Further, it is shown that corotating proton flux enhancements are associated with regions of low coronal X-ray emission (including coronal holes), usually in association with solar wind stream structure. M.G.

N80-19683*# Ohio State Univ., Columbus. ElectroScience Lab.
ATMOSPHERIC WATER VAPOR ABSORPTION AT 12 CO2 LASER FREQUENCIES Final Report
Robert J. Nordstrom, Michael E. Thomas, John F. Donovan, and Karl Gass Sep. 1979 82 p
(Contract JPL-955458)
(NASA-CR-162850; Rept-711934-1) Avail: NTIS HC A05/MF A01 CSCL 04A

Measurements of the absorption of CO2 laser radiation in the 9.4 micron band by pressure broadened water vapor samples are summarized. The water vapor temperatures used were 25, 30, and 35 C. K.L.

N80-19684*# Alabama Univ. in Huntsville. School of Science and Engineering.
MAGNETOSPHERIC RESEARCH Quarterly Progress Report, Dec. 1979 - Feb. 1980
Richard H. Comfort and James L. Horwitz Mar. 1980 7 p refs
(Contract NAS8-30563)
(NASA-CR-161410) Avail: NTIS HC A02/MF A01 CSCL 04A

Research concerning the magnetosphere is discussed in terms of satellite data analysis, instrument studies and developments, solar terrestrial studies, meetings, and consultants. R.E.S.

N80-19685# Washington Univ., Seattle. Space Sciences Div.
COORDINATED FIELD OPERATION OF BALLOON-BORNE AURORAL X-RAY EXPERIMENT FROM THE ATS-F SATELLITE CONJUGATE REGION Final Report 1 Mar. 1974 - 31 Jan. 1978
George K. Parks Nov. 1978 4 p
(Contract N00014-67-A-0103-0039; NR Proj. 012-724)
(AD-A078041) Avail: NTIS HC A02/MF A01 CSCL 04/1

The results obtained during this contract period have provided a basis for improving and developing new instruments. We have designed a new X-Ray imaging detector that is capable of taking snapshots of the sky in X-rays. Results from this detector design will provide additional information on electron precipitation scales and source dimensions. GRA

N80-19686# Pennsylvania State Univ., University Park. Ionosphere Research Lab.
MEASUREMENT OF ELECTRON DENSITIES IN THE MIDDLE ATMOSPHERE USING ROCKET BORNE BLUNT PROBES
Thomas M. York White Sands Missile Range, N. Mex. Army Electronics Research and Development Command Oct. 1979 31 p refs Sponsored in part by Battelle Columbus Labs.
(Contract DAAG29-76-D-0100; DA Proj. 1L1-61102-B-53A)
(AD-A078148; ERADCOM/ASL-CR-79-0100-5) Avail: NTIS HC A03/MF A01 CSCL 04/1

Detailed consideration has been given to the determination of electron number density from conductivity data gathered by rocket borne blunt probes in the middle atmosphere. A definition of the difficulty of electron density determination is presented. The procedures of determination of ion densities in the middle atmosphere are reviewed and critically evaluated. The specific aspects of particle collection by a supersonic probe are evaluated and compared to those of a subsonic probe; it is indicated that compression (x10) regions will form in front of supersonic probes at altitudes up to 100 km, and that electron attachment rates

could significantly alter electron and negative ion concentrations. A summary of the analysis of negative conductivity data to indicate electron density is presented. Data from four days, January 31, 1972, and December 5, 1972 (WI), and October 2, 1975, and September 29, 1977 (WSMR), are reduced and electron density profiles presented; these are compared with the indication of electron density from other diagnostics. In the region of overlap of data, there is general agreement in the electron density predictions; the indication of electron density at altitudes below 70 km are new, but the theory for this region is felt to be most accurate. GRA

N80-19687# Lockheed Missiles and Space Co., Palo Alto, Calif.
IONOSPHERIC-MAGNETOSPHERIC PLASMA EXPERIMENT (IMPE) Final Report
E. G. Shelley 15 Oct. 1979 21 p
(Contract N00014-75-C-0099)
(AD-A078082; LMSC-D678863) Avail: NTIS HC A02/MF A01 CSCL 04/1

The Ionospheric-Magnetospheric Plasma Experiment (IMPE) consists of three mass spectrometers covering the energy per charge range from 500 eV to 16 KeV and the mass range from 1 AMU to greater than 150 AMU plus four electron spectrometers covering the energy range from approximately 70 eV to 24 KeV. The IMPE was intergrated into the ARPA 301 payload as the MPA-002 prior to the integration of ARPA-301 with the spacecraft. The spacecraft was launched on 24 February 1979 into a low altitude polar orbit. On the basis of quick look data received at the satellite control facility, we were able to determine from the analog monitors that all of the experiment high voltage systems were operating as expected. The primary utilization of the IMPE data will be in coordinated studies with data from the SC-8 experiment on the SCATHA spacecraft.GRA

N80-19688# Aerodyne Research, Inc., Bedford, Mass.
NITRIC OXIDE ION AND URANIUM OXIDE ION STUDIES Final Report, 25 Mar. 1976 - 31 Mar. 1979
Fritz Bien Hanscom AFB, Mass. AFGL Jun. 1979 39 p refs
(Contract F19628-76-C-0178; DNA Proj. NWED-QAXHI002)
(AD-A077870; ARI-AR-171; AFGL-TR-79-0164) Avail: NTIS HC A03/MF A01 CSCL 04/1

The radiative lifetimes of infrared active ions are of particular importance in determining the background radiation in a disturbed atmosphere. The geomagnetic field striates ionic species causing these radiators to form a non-uniform background. Thus, even at lower concentration than molecular species, ions play a more important role in the analysis of disturbed atmospheric signatures. This research was undertaken to measure the radiative lifetime and quenching of vibrationally hot ions NO- and UO-. These molecular ions are of particular importance because of their low ionization energies. Nitric oxide has the lowest ionization energy for those ions that can be formed from the natural atmospheric species, N2, O2, and O. The disappearance of NO- in the upper atmosphere is dependent only on its dissociative recombination rate. The uranium oxide ion is endothermic to dissociative recombination, thus it is one of the most important metallic oxide ions in the upper atmosphere. Since its disappearance depends on three body recombination, this ion would be an important contributor to the 11-14 micrometers infrared signature in a disturbed atmosphere. The measurement of the radiative lifetime and transfer rate of vibration energy from NO- to N2 has been measured and is presented in the appendix. GRA

N80-19689# Weston Observatory, Mass.
INVESTIGATION OF MAGNETIC FIELD PHENOMENA IN THE IONOSPHERE
John F. Devane and Edward A. Johnson Jan. 1979 33 p refs
(Contract F19628-76-C-0291; AF Proj. 7601)
(AD-A075356; AFG-TR-79-0044; SR-1) Avail: NTIS HC A03/MF A01 CSCL 04/1

This report summarizes the work in maintaining a network of geomagnetic observatories designed to collect and digitally transmit variations of the geomagnetic field. Lightning protection was designed and installed on the induction coil magnetometers. Power supplies of the fluxgate magnetometers were updated, scale changes modified, cooling capacity increased. New temperature control of trailers installed. The changing total field component is traced over the past five years and a method of calibrating the fluxgate magnetometer is outlined. Author (GRA)

N80-19690# Illinois Univ. at Urbana-Champaign. Dept. of Electrical Engineering.
MODEL COMPUTATIONS OF RADIO WAVE SCINTILLATION CAUSED BY EQUATORIAL BUBBLES Scientific Report, Jul. 1978 - Jul. 1979
A. W. Wernik Hanscom AFB, Mass. AFGL Jul. 1979 80 p refs
(Contract F19628-78-C-0195; AF Proj. 4643)
(AD-A077028; UILU-ENG-79-2555; AFGL-TR-79-0165; SR-1)
Avail: NTIS HC A05/MF A01 CSCL 04/1

The apparent inhomogeneous nature of the equatorial electron density irregularities indicate that a new approach to the scintillation theory is required. Based on the available in situ electron density measurements and theoretical information, a simple two-dimensional, deterministic model of the equatorial bubble is developed. The parabolic equation for a wave traversing such a bubble is solved numerically. The computed amplitude pattern suggests that wave diffraction on edges formed by sharp horizontal electron density gradients may be a possible cause of scintillation at gigahertz frequencies. Comparison with the results obtained for a model of random irregularities with the same power spectrum shows that the medium characterized by sharp electron density gradients leads to stronger scintillation in a wide frequency range. The amplitude pattern, scintillation index, frequency dependence and scatter plots computed for the model agree well with observations. Author (GRA)

N80-19691# Boston Univ., Mass. Dept. of Astronomy.
DMSP AURORAL IMAGES AND THE GOOSE BAY IONOSPHERE Final Scientific Report, Oct. 1977 - 30 Sep. 1978
C. C. Chacko and Michael Mendillo Hanscom AFB, Mass. AFGL Jan. 1979 46 p refs
(Contract F19628-78-C-0011; AF Proj. 4643)
(AD-A077023; AFGL-TR-79-0023) Avail: NTIS HC A03/MF A01 CSCL 04/1

The DMSP/Goose Bay data base consisting of all DMSP images obtained between December 9, 1971 and September 21, 1973 with Goose Bay in the field of view, forms the basis of this study aimed at examining auroral and ionospheric conditions prevailing in the vicinity of Goose Bay. It was found that little of a systematic nature could be deduced from attempts to correlate the presence of auroral activity near Goose Bay with parameters like delta foF2, delta TEC etc., although past studies had established that aurorally induced electron density enhancements in the upper ionosphere always occur a few degrees equatorward of the low latitude boundary of the continuous aurora. Another major result of the sturly is the finding that the phase of the auroral electro-jet activity is important in determining the proximity of continuous aurora to Goose Bay. Two case studies are discussed to illustrate the correspondences between auroral activity captured on DMSP images on the one hand and ionospheric parameters on the other. GRA

N80-19692# Army Military Personnel Center, Alexandria, Va.
DELTA7: A COMPUTER MODEL OF DELTA GROWTH Final Report
Dominic Izzo Oct. 1979 49 p refs
(AD-A077053) Avail: NTIS HC A03/MF A01 CSCL 08/3

Delta 7 is an interactive FORTRAN IV Computer Program written for the PDP-11 mini-computer. It accepts initial beach and river conditions, as well as a varying set of deepwater wave conditions, and produces a data set that outlines a planview of the coastline at specified time intervals. The coastline can subsequently be graphed using the Calcomp 1037 Drum Plotter with the XPLOT instruction of MAGIC. The use of computer simulation technique allows a comparison of the effects of varying the order of wave attacks on a developing river delta, which is supplied a constant amount of sediment per day. The conclusion is that random ordering produces approximately the same delta every time, whereas ordering the waves according to power results in a radical delta. This paper includes sample data, computer program and several graphs. GRA

N80-19693# SRI International Corp., Menlo Park, Calif.
ATMOSPHERIC ELECTRICITY AND MILITARY OPERATIONS Final Report
J. E. Nanevicz Nov. 1978 8 p refs
(Contract N00014-77-C-0326)
(AD-A078482) Avail: NTIS HC A02/MF A01 CSCL 04/2

Contents: An Airborne Electric Field-Meter System Used for Studying Electric Field Structure Near Thunderstorm Cells; A Triggered Lightning Strike to an Instrumented Learjet Aircraft; and Instrumented Learjet Aircraft Measurements of Static Electric Fields in and Around Florida Thunderstorm anvils. GRA

N80-19694# California Inst. of Tech., Pasadena. Seismological Lab.
BODY AND SURFACE WAVE MODELING OF OBSERVED SEISMIC EVENTS
David G. Harkrider, Donald V. Helmberger, and J. Bernard Minster Sep. 1979 106 p refs
(Contract F49620-77-C-0022; ARPA Order 3291)
(AD-A078056; AFOSR-79-1235TR) Avail: NTIS HC A06/MF A01 CSCL 08/1

The research performed under this contract during the period 1 Oct. 1978 through 31 March 1979 can be divided into three main topics, upper mantle studies, propagational distortions caused by non-planar structure and S wave generation by block movements near explosions. In Section 2, we discuss the upper mantle structure of northwestern Eurasia where long period and short period WWSS seismograms from nuclear explosions in the Soviet Union have been incorporated with published apparent velocity data to derive a compressional wave velocity model for the upper mantle beneath northwest Eurasia. The waveforms were modeled using generalized ray theory and a starting model was perturbed by trial and error until a fit was achieved. The seismograms from 9-13 deg exhibit impulsive first arrivals (Pn), implying a smooth, positive velocity gradient between depths of 60 and 150 km. A consistent pulse arriving about 2 seconds after Pn at the ranges 11 to 17 deg is modeled by positioning a low velocity zone between 150 and 200 km. In Section 3, glorified optics has been used to compare the waveform complications caused by two and three dimensional structures. A scheme is developed to synthesize seismic images, in which the direct rays give a preliminary feature of a structure, while the multiple boundes provide further information for improving and refining the model. In Section 4, we consider the problem of reflection and refraction of purely compressional waves incident on an interface separating identical solid half-spaces in which the condition of continuity of shear displacement at the boundary is generalized to one that allows slippage. GRA

N80-19695# Sandia Labs., Albuquerque, N. Mex. Telemetry Development Div.
FIELDS FROM A VERTICAL MAGNETIC DIPOLE
T. W. H. Caffey Sep. 1979 22 p refs
(Contract EY-76-C-04-0789)
(SAND-79-0449) Avail: NTIS HC A02/MF A01

Both the E and H fields from a vertical magnetic dipole placed in the third layer of a three-layer Earth are derived. The results are applied to transmission beneath two Wyoming coal seams to see the effects of the overburden upon the voltage induced in a horizontal loop which is coplanar with the dipole. Beneath each seam, the effects of the overburden can be neglected when both the dipole and loop are at least one meter below the seam and when the operating frequency is less than 15 kHz. DOE

N80-19696# Sandia Labs., Albuquerque, N. Mex.
INDIRECT DEFORMATION (STRAIN) MEASUREMENTS AND CALIBRATIONS IN SANDIA TRIAXIAL APPARATUS FOR ROCK TESTING TO 250 C
W. R. Wawersik Sep. 1979 53 p refs
(Contract EY-76-C-04-0789)
(SAND-79-0114) Avail: NTIS HC A04/MF A01

Indirect procedures for axial and radial strain measurements on rock in triaxial tests to 250 C are presented. The description of techniques includes discussions of all calibrations and of the accuracies of measurements. In addition, two examples are given to show how the techniques are implemented in triaxial compression and triaxial extension experiments. DOE

N80-19697# Argonne National Lab., Ill. Radiological and Environmental Research Div.
ON THE ROLE OF THE ATMOSPHERIC ZONAL INDEX CYCLE IN SOLAR/TERRESTRIAL COUPLING
Paul Frenzen 29 Jun. 1979 10 p refs Presented at the DOE Solar Terrest. Workshop, Los Alamos, N. Mex., 27-29 Jun. 1979
(Contract W-31-109-eng-38)
(CONF-7906119-1) Avail: NTIS HC A02/MF A01

The coupling of variations in solar output to short term changes in terrestrial weather is discussed taking into account the role of upper atmospheric circulation shifts. K.L.

N80-19698# National Oceanic and Atmospheric Administration, Boulder, Colo.
GEODYNAMICS INTERNATIONAL - 15
Aug. 1979 64 p Prepared in cooperation with the Inter-Union Commission on Geodynamics, Vancouver, British Columbia
(PB80-111099; SE-19) Avail: NTIS HC A04/MF A01 CSCL 08G

Geodynamics Project is an international program of research on the dynamics and dynamic history of the Earth with emphasis on deep seated foundations of geological phenomena. This includes investigations related to movements and deformations, past and present, of the lithosphere and all relevant properties of the Earth's interior and especially any evidence for motions at depth. Reports on commission activities, working group activities, highlights of scientific symposia, and national committee reports are presented. GRA

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N80-19699 Wisconsin Univ. - Madison.
VISIBLE FLUX VARIATIONS ACROSS FINITE CLOUDS Ph.D. Thesis
Frederick Ray Mosher 1979 123 p
Avail: Univ. Microfilms Order No. 7918922

A radiative transfer model that treats visible flux variations across and within finite clouds of varying shapes was developed to investigate the parameters which influence the brightness patterns observed on satellite images. Simulations showed that fluxes coming from all external regions of finite cubic clouds departed significantly from the plane-parallel results. Regions of liquid water concentrations near the cloud top appeared as bright regions for the overhead sun, but had very little effect at large solar zenith angles. When the concentration was more than an optical thickness of 25 below the top, the bright spot disappeared. A tower on top of a cubic cloud appeared darker than the main body of the cloud for the overhead sun, and brighter than the main body when the sun was near the horizon. The relationship between albedo and solar zenith angle varied with cloud shape. Clouds simulated by assemblies of cubic elements matched aircraft flux measurements better when the overall cloud shape resembled the observed cloud shape than when the cubic elements were assembled into a simple shape of equivalent dimensions.
Dissert. Abstr.

N80-19700 British Library Lending Div., Boston Spa (England).
CALCULATIONS USING A MODEL OF THE SEASONAL VARIATION IN THE CONCENTRATION OF NITROGEN COMPOUNDS IN THE TEMPERATE STRATOSPHERE
I. L. Karol' 11 Jun. 1979 22 p refs Transl. into ENGLISH from Glav. Geof. Obs. T. (Leningrad), Vyp. 394, 1977 p 56-65 In RUSSIAN and ENGLISH
(BLL-Trans-1400-(9022.549)) Avail: British Library Lending Div., Boston Spa, Engl.

A one dimensional, nonstationary mathematical model of the stratosphere is presented. The model describes the seasonally fluctuating, vertical, macroturbulent transport of the oxides of nitrogen in the 10 to 50 km layer. The model also describes the photochemical transformation of these traces. The model is used to predict the concentration of ozone in the stratosphere,

to estimate the effect of anthropogenic sources of oxides of nitrogen in the atmosphere, and to estimate the emission of such compounds from the engines of high flying aircraft. A.W.H.

N80-19701 British Library Lending Div., Boston Spa (England).
METHODS FOR ANALYSING THE HOMOGENEITY OF CLIMATOLOGICAL SERIES
N. V. Kobysheva and V. D. Antonevich 27 Jun. 1979 11 p refs Transl. into ENGLISH from Glav. Geof. Obs., T. (Leningrad), Vyp. 404, 1978 p 45-50 In RUSSIAN and ENGLISH
(BLL-Trans-1407-(9022.549)) Avail: British Library Lending Div., Boston Spa, Engl.

The problem of identification and removal of nonhomogeneity in climatological series is discussed. Homogeneity is defined to be a series whose values vary from year to year or from one period to another only in weather and climate for the given region. Climatological nonhomogeneity is defined in connection with the relocation of weather stations, changes in the location of meteorological instruments, or in the methods and times of observations. The differences between climatological nonhomogeneity and statistical nonhomogeneity are examined and methods to analyze each version of nonhomogeneity are discussed.
A.W.H.

N80-19702 British Library Lending Div., Boston Spa (England).
STABILITY ANALYSIS OF KINETIC MODELS OF THE GLOBAL C-CYCLE: EXCHANGE OF CARBON BETWEEN LAND BIOTA AND ATMOSPHERE UNDER THE INFLUENCE OF MAN
G. H. Kohlmaier, E. O. Sire, G. Kratz, and U. Fischbach 27 Jun. 1979 16 p refs Transl. into ENGLISH from Ber. Bunsenges. Phys. Chem. (Weinheim), v. 82, 1978 p 1218-1223 In ENGLISH and GERMAN
(BLL-Trans-1421-(9022.549)) Avail: British Library Lending Div., Boston Spa, Engl.

The autonomous, natural dynamics of a certain subsystem (e.g. land biosphere) are described as the difference of an input and an output rate of a general non-linear structure. In particular the two-compartment system atmosphere-land biosphere is presented and treated as a materially open as well as a closed system. As a result, a non-linear approach may lead to opposed stability behaviour with respect to the corresponding linearized as well as to the ad-hoc-linear rate expressions obtained. It is noteworthy that the stability and instability transition occurred at a critical rate with values in the same order of magnitude as the present estimates of the anthropogenic transfer of biogenic carbon to the atmosphere. Some simple rules to determine the global stability of closed autonomous systems and apply them to the global carbon cycle are also presented. R.E.S.

N80-19703*# FWG Associates, Inc., Tullahoma, Tenn.
FOG DISPERSION Final Report
Larry S. Christensen and Walter Frost Mar. 1980 128 p refs
(Contract NAS8-33095)
(NASA-CR-3255) Avail: NTIS HC A07/MF A01 CSCL 04B

The concept of using the charged particle technique to disperse warm fog at airports is investigated and compared with other techniques. The charged particle technique shows potential for warm fog dispersal, but experimental verification of several significant parameters, such as particle mobility and charge density, is needed. Seeding and helicopter downwash techniques are also effective for warm fog dispersals, but presently are not believed to be viable techniques for routine airport operations. Thermal systems are currently used at a few overseas airports; however, they are expensive and pose potential environmental problems.
K.L.

N80-19704*# Georgia Inst. of Tech., Atlanta.
THE NASA/MSFC GLOBAL REFERENCE ATMOSPHERIC MODEL: MOD 3 (WITH SPHERICAL HARMONIC WIND MODEL) Final Report
C. G. Justus, G. R. Fletcher, F. E. Gramling, and W. B. Pace Mar. 1980 254 p refs
(Contract NAS8-32897)
(NASA-CR-3256; M-296) Avail: NTIS HC A12/MF A01 CSCL 04B

Improvements to the global reference atmospheric model are described. The basic model includes monthly mean values of pressure, density, temperature, and geostrophic winds, as well as quasi-biennial and small and large scale random perturbations. A spherical harmonic wind model for the 25 to 90 km height range is included. Below 25 km and above 90 km, the GRAM program uses the geostrophic wind equations and pressure data to compute the mean wind. In the altitudes where the geostrophic wind relations are used, an interpolation scheme is employed for estimating winds at low latitudes where the geostrophic wind relations being to mesh down. Several sample wind profiles are given, as computed by the spherical harmonic model. User and programmer manuals are presented. K.L.

N80-19705*# National Aeronautics and Space Administration, Washington, D. C.
CALCULATION OF THE RELATIONSHIP BETWEEN ATTENUATION AND INTENSITY OF PRECIPITATION FOR VARIOUS POLARIZATIONS
Dario Maggiori and Aldo Paraboni Feb. 1980 30 p refs Transl. into ENGLISH of "Calcolo del legame attenuazione - intensita di precipitozione per varie polarizzazioni", Rept. IB4577, Fondazione Ugo Bordani, Rome, Oct. 1977 p 1-28 Translation was announced as N79-27382 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3198)
(NASA-TM-75779; IB4577) Avail: NTIS HC A03/MF A01 CSCL 04B

An algorithm is presented which investigates the behavior of attenuation and phase differences in circular and linear polarizations. R.E.S.

N80-19706*# Air Force Geophysics Lab., Hanscom AFB, Mass.
PRELIMINARY ASSESSMENT OF AN AUTOMATED SYSTEM FOR DETECTING PRESENT WEATHER Instrumentation Paper
H. Albert Brown 26 Jun. 1979 37 p refs
(AD-A078031; AFGL-TR-79-0137; AFGL-IP-276) Avail: NTIS HC A03/MF A01 CSCL 04/2

The determination of subjective weather observations through the use of an automated array of weather sensors coupled with a decision tree program was examined through analysis of data gathered at the AFGL Weather Test Facility at Otis AFB, Mass. This report describes the instruments used in the array, the response of the instruments to type of weather observed, and the decision tree programs. Preliminary results indicate that a computer-controlled weather sensor array has potential value in determining objectively those types of weather previously relegated to human responsibility. Author (GRA)

N80-19707*# University of Central Florida, Orlando. Dept. of Mathematics and Statistics.
SOME MODELS FOR CEILING Scientific Report, 1 Sep. 1978 - 31 Aug. 1979
Steven J. Bean, Paul N. Somerville, and Mark Heuser Hanscom AFB, Mass. AFGL 31 Aug. 1979 40 p
(Contract F19628-77-C-0080; AF Proj. 6670)
(AD-A078033; AFGL-TR-79-0221; SR-1) Avail: NTIS HC A03/MF A01 CSCL 04/2

There are many situations where it is useful to estimate the probability that some weather event will occur on some specified future date. A way of making the estimate is to calculate the proportion of time that the event occurred in previous years. There exist large environmental data bases that can be used to make such estimates. Because these data bases are so large, summaries are usually used. USAFETAC, Air Weather Service, regularly produces, for a large number of stations, a 'Revised Uniform Summary of Surface Weather Observations'. These 'RUSSWO's' provide a very convenient summary and are widely used. This report makes use of the Burr Curve with three parameters to effectively compact data on ceiling for a number of locations. The Burr Curve, which has a closed form cumulative distribution function, is used to model ceiling. Ceiling is modeled for 23 stations distributed throughout the world. Separate models are given for each station for each month and for each three-hour period of the day. Estimates of the error in using the model to estimate ceiling probabilities are given. GRA

N80-19708*# Naval Air Systems Command, Washington, D. C.
GUIDE TO STANDARD WEATHER SUMMARIES AND

CLIMATIC SERVICES
J. W. Ownbey, ed. Jan. 1980 206 p Revised
(AD-A078660; NAVAIR-50-1C-534) Avail: NTIS
HC A10/MF A01 CSCL 04/2

This report provides a description of published and unpublished climatological summaries available from the climatic complex in Asheville, NC. It also includes a catalogue of the available summaries on a world-wide basis in continent-country-station order. GRA

N80-19709# University of Central Florida, Orlando. Dept. of Mathematics and Statistics.
SOME ADDITIONAL MODELS FOR RAINFALL Scientific Report, 1 Sep. 1978 - 31 Jun. 1979
Paul N. Somerville and Steven Bean, J. Hanscom AFB, Mass. AFGL 31 Aug. 1979 35 p
(Contract F19628-77-C-0080)
(AD-A077872; AFGL-TR-79-0220; SR-6) Avail: NTIS
HC A03/MF A01 CSCL 04/2

The Kappa distribution, which has a closed form cumulative distribution, is used to model daily rainfall for 24 stations distributed throughout the world. Separate models are given for each month. Estimates of the amounts of error in using the model to predict daily rainfall less than a stated amount are given. GRA

N80-19710# Scientific Systems, Inc., Cambridge, Mass.
MULTISPECTRAL CLOUD IDENTIFICATION STUDY Report, 14 Jul. 1977 - 14 Aug. 1978
Donald E. Gustafson, William H. Ledsham, Mary G. Fowler, and Eliot S. Blackman Hanscom AFB, Mass. AFGL Sep. 1978 277 p refs
(Contract F19628-77-C-0208; AF Proj. 6698)
(AD-A077873; AFGL-TR-78-0280) Avail: NTIS
HC A13/MF A01 CSCL 04/2

Tactical and meteorological considerations demand a knowledge of cloud cover on a global basis. Since areas exist which are either data poor or denied by hostile forces, it is reasonable to infer cloud parameters in these regions from satellite-borne passive sensors. Both channel selection and inversion methodology to maximize the amount of cloud information are currently open questions. This study deals with the problem of inferring both cloud and 'nuisance' parameters given four frequencies in the microwave region (10 GHz, 19 GHz, 37 GHz and 94 GHz) and ten frequencies in the thermal IR, near IR and visible region (.55, .72, 1.0, 1.6, 2.1, 3.8, 6.7, 10.5, 11.5, and 12.5 micrometers). Using simulated data, several studies were made. Results indicate that the iterated extended Kalman filter is a robust method of cloud parameter estimation, and that while some parameters such as cloud top height and liquid water content are well estimated, others such as cloud thickness are not. Finally, simple decision trees may be formulated to distinguish the scenes analyzed. GRA

N80-19711# Oklahoma Univ., Norman.
DYNAMIC DATA ASSIMILATION BY THE NOISE FREEZING METHOD Final Report
Y. K. Sasaki, Tom Baxter, and James S. Goerss Sep. 1979 82 p refs
(Contract N00228-77-C-3056; ZF52551792)
(AD-A077901; NEPRF-CR-79-03) Avail: NTIS
HC A05/MF A01 CSCL 04/2

A barotropic model was developed using a variational method to conserve mass and total energy. This model was then used to assimilate satellite data by adjusting the fluid depth so that gravity waves moved at about the same speed as meteorological waves. The analyses resulting from the assimilation runs were used to adjust the 1000-500 mb thickness in a baroclinic forecast system. Although results were obtained from only one experiment, they show some promise for improving forecasts, particularly in the southern hemisphere. A baroclinic global model was then developed so that the gravity waves could be decreased in speed during the period of data assimilation of satellite data. Initial tests suggest that imbalances in the model caused by data insertion can be controlled, thereby allowing a more accurate analysis of the satellite data. GRA

N80-19712# Air Weather Service, Scott AFB, Ill.
SATELLITE TRAINING COURSE NOTES. PART 4: CLOUD PATTERNS AND THE UPPER AIR WING FIELD
Roger Weldon Oct. 1979 99 p
(AD-A077557; AWS-TR-79-003-Pt-4) Avail: NTIS
HC A05/MF A01 CSCL 04/2

The information in this report was derived empirically from the study of SMS-GOES system satellite imagery and atmospheric data, analyses, and progs distributed by the United States' National Weather Service. The text provides simple comparisons between satellite-observed cloud patterns and the wind field. GRA

N80-19713# Army Electronics Research and Development Command, White Sands Missile Range, N. Mex.
THE VISIOCEILOMETER: A PORTABLE CLOUD HEIGHT AND VISIBILITY INDICATOR
Robert S. Bonner and William J. Lentz Oct. 1979 40 p refs
(AD-A078332; ERADCOM/ASL-TR-0042) Avail: NTIS
HC A03/MF A01 CSCL 04/2

The first experimental prototype (model-1) visioceilometer has been developed. It measures cloud height from 50 to 3000 meters with 10 meter accuracy and calculates visibility from a sample volume up to 1 kilometer in length of the lidar return. It consists of a hand-held, battery-operated lidar which uses the AN/GVS-5 laser rangefinder optics. Measurements of visibility in fog and cloud ceiling height in clear air and rain were taken at the fog dispersion test facility at Otis Air Force Base, MA. In relatively homogeneous fogs, the visibility accuracy was comparable to standard transmissometers. The cloud ceiling accuracy was also comparable to the standard rotating beam ceilometer. GRA

N80-19714# Air Weather Service, Scott AFB, Ill.
AN INVESTIGATION OF RADAR RETURNS AND THEIR RELATIONSHIP TO SEVERE WEATHER OCCURRENCES Final Report
Werner Helmut Balsterholt Nov. 1979 102 p refs
(AD-A078858; AWS-TR-79-004) Avail: NTIS
HC A06/MF A01 CSCL 04/2

FPS-77 5.4 cm radar information was gathered throughout the US, geographically and temporally separated to delineate severe from non-severe thunderstorms. The critical success indicator is used to determine the relative reliability of various radar signatures investigated. Thunderstorm structure is reviewed and evolution and development of severe storms is discussed. Environments of severe storms is analyzed and related to well-established severe storm criteria. Results reveal the 30 dBz heights, when correlated with tropopause height or height of the total storm, are excellent signatures which frequently define those thunderstorms likely to be associated with severe weather. GRA

N80-19715# Science Applications, Inc., El Segundo, Calif.
RAIN ATTENUATION OVER EARTH-SATELLITE PATHS Final Report, 27 Dec. 1978 - 25 May 1979
Nathaniel E. Feldman May 1979 154 p
(Contract N00039-79-C-0136)
(AD-A075390; SAI-171-80-573-LA) Avail: NTIS
HC A08/MF A01 CSCL 04/2

This analysis of precipitation-attenuation over Earth-satellite paths extends R. K. Crane's model by correcting for measured total rainfall and frequency of occurrence. The authors convert Crane's model to a seasonal one and extend it up to 36 percent of the time. Four seasonal world maps show the location of the nine precipitation rate regions and another four show mean freezing height. A method for estimating the outage duration distribution is proposed and used to determine the mean daily outrage duration and the number of outages per day. GRA

N80-19718# Air Force Weapons Lab., Kirtland AFB, N. Mex.
CLOUDS Final Report
Mark K. Seager Aug. 1979 55 p refs
(AD-A078363; AD-E200400; AFWL-TR-79-108) Avail: NTIS
HC A04/MF A01 CSCL 04/2

This report is an in-depth Users Manual for the ANSI FORTRAN computer program CLOUDS. CLOUDS is designed in two major blocks: cloud field generation and cloud-free line-of-sight (CFLOS) calculation. The cloud field generation block models

observed cloud fields using rotated truncated ellipsoids and rotated eliptical cylinders. The user can specify an overall (total) cloud cover or cloud cover by base height, dimensions of the clouds to be used, and fraction of clouds to be cylinders. When the cloud field has been completed, two types of plots (two-dimensional printer plots and three-dimensional META Plots) can be generated in order to view the modeled cloud field. The CFLOS calculation block generates trajectory data using either direct intercept or a chase model. Alternately, a trajectory with one defender and one to four aggressors generated by the Trajectory Analysis Program (TAP) can be used. Instantaneous CFLOS and CFLOS over discrete time intervals are calculated between the defender and each aggressor. The trajectories are rotated some user specified number of times within the stationary cloud field and the CFLOS data are recalculated. GRA

N80-19717# University of Central Florida, Orlando. Dept. of Mathematics and Statistics.
A NEW MODEL FOR SKY COVER Scientific Report, 1 Sep. 1978 - 27 Aug. 1979
Paul N. Somerville and Steven J. Bean 27 Aug. 1979 37 p refs
(Contract F19628-77-C-0080; AF Proj. 6670)
(AD-A078368; AFGL-TR-79-0219; SR-5) Avail: NTIS HC A03/MF A01 CSCL 04/2

The S-distribution, which has a closed form cumulative distribution function is used to model sky cover. Models are developed for 23 stations distributed throughout the world, one for each month and for each three-hour period of the day. Estimates of the amounts of error in using the model to predict cloud cover less than a stated amount are given. Author (GRA)

N80-19718# Wisconsin Univ. - Madison. Space Science and Engineering Center.
INITIAL STUDIES IN OBJECTIVE FORECASTING OF MESOSCALE WEATHER USING INTERACTIVE COMPUTER SYSTEM
Carlyle H. Wash, Thomas M. Whittaker, and Donald R. Johnson 15 Jun. 1979 25 p refs
(Contract F19628-78-C-0137; AF Proj. 6670)
(AD-A077343; AFGL-TR-79-0247; SR-1) Avail: NTIS HC A02/MF A01 CSCL 04/2

Subsynoptic convective areas are isolated, monitored and forecast through extrapolation and advection using McIDAS, (Man-Computer Interactive Data Access System), and interactive computer video-display system. Research on isolating the convective areas focuses on development of statistics using digital visual and IR GOES satellite data to delineate areal coverage and intensity. McIDAS algorithms have been developed to: (1) compute the brightness centroid; (2) form a best-fit ellipse to the region; and (3) compute areal average IR and normalized-visual brightness. Sequences of brightness centers and geometric outlines serve as input extrapolation routines to project system movement and change in area coverage and intensity. Research also has been initiated on using vertically-integrated wind fields to advect meteorological fields and disturbances. Preliminary results using these techniques for short-range forecast are presented. Author (GRA)

N80-19719# Wisconsin Univ. - Madison. Dept. of Meteorology.
LIDAR MEASUREMENT OF BOUNDARY LAYER WINDS AND CONVECTIVE STRUCTURE Final Report, 1 Mar. 1976 - 30 Jun. 1979
Edwin W. Eloranta 20 Aug. 1979 177 p refs
(Grant DAAG29-76-G-0156)
(AD-A078590; ARO-13535.2-GS) Avail: NTIS HC A09/MF A01 CSCL 04/2

The following report is a summary of studies on planetary boundary layer visualization and remote determination of wind profiles and turbulence quantities by means of a lidar. These investigations rely on inhomogeneities in the natural aerosol distribution to delineate eddies in the boundary layer. Measurement of the rate of displacement of these eddies yield horizontal wind components. Observations of the daytime growth of the convective boundary layer are compared to a theoretical model. GRA

N80-19720# Naval Environmental Prediction Research Facility, Monterey, Calif.
WINTER SHAMAL IN THE PERSIAN GULF Final Report
Thomas J. Perrone Aug. 1979 179 p refs
(AD-A077727; NEPRF-TR-79-06) Avail: NTIS HC A09/MF A01 CSCL 04/2

Occurrence and air/sea effects of the winter shamal, a subsynoptic-scale wind phenomenon in the Persian Gulf region, are examined by means of a conceptual model which relates upper air and surface features to mesoscale weather events and conditions. Two case studies based on surface data and satellite imagery are presented to illustrate the model. A regional wind climatology and a collection of rules of thumb for shamal forecasting are provided. GRA

N80-19721# Oregon Graduate Center for Study and Research, Beaverton. Dept. of Applied Physics and Electronic Science.
EXPERIMENTAL PULSED LASER REMOTE CROSSWIND MEASUREMENT SYSTEM. FEASIBILITY STUDY AND DESIGN, PART 5 Final Report, 15 Nov. 1976 - 31 Dec. 1977
J. Fred Holmes, J. Richard Kerr, Richard A. Elliott, Myung H. Lee, Philip A. Pincus, and Michael E. Fossey Sep. 1978 62 p refs
(Contract DAAA25-76-C-0132; DA Proj. 1L1-62617-AH-19)
(AD-A077631; AD-E400339; SCF-I-IR(CR)-79-002-Pt-5; ARSCD-CR-79007-Pt-5) Avail: NTIS HC A04/MF A01 CSCL 04/2

Recent activity with regard to development of a pulsed laser, remote crosswind measurement system is described. Work was concentrated on system improvements and testing. The improvements included the ability to directly measure the average received intensity, a method of aligning the two laser beams so that they are colinear; normalization to compensate for turbulence strength and laser coherence, and accurate automatic gain calibration. Testing included a comparison of the pulsed crosswind system with in situ measurements and cw measurements of the time delayed statistics. Author (GRA)

N80-19722# University of Central Florida, Orlando. Dept. of Mathematics and Statistics.
SOME MODELS FOR WINDSPEED Scientific Report, 1 Sep. 1978 - 15 Jul. 1979
Steven J. Bean and Paul N. Somerville Hanscom AFB, Mass. AFGL 16 Jul. 1979 41 p
(Contract F19628-77-C-0080; AF Proj. 6670)
(AD-A077048; AFGL-TR-79-0180; SR-4) Avail: NTIS HC A03/MF A01 CSCL 04/2

Models are given for the probability of a windspeed greater than an arbitrary value, for each of 25 stations. The two parameter Weibull model is used. Separate sets of parameters are given for each station for each month and for each of the eight 3 hour periods of the day. Measures of 'goodness' of the models are given. GRA

N80-19723# Naval Ship Research and Development Center, Bethesda, Md. Ship Performance Dept.
ATLAS OF NAVAL OPERATIONAL ENVIRONMENTS: THE NATURAL MARINE ENVIRONMENT Final Report
Susan Lee Bales and Edward W. Foley Sep. 1979 345 p refs
(AD-A077033; DTNSRDC/SPD-0795-01) Avail: NTIS HC A15/MF A01 CSCL 04/2

From the viewpoint of some ship designers, a fundamental deficiency in the current process by which naval combatants are designed is the lack of interface and feedback between the design of the major subsystems of the total ship. In order to address this deficiency, the development of an 'Atlas of Naval Operational Environments' was proposed which included both threat (man-made) and natural (those occurring in nature) environments which naval forces could be expected to encounter. The Atlas would be directed to the ship combat systems designer. This report provides the natural environments required by the Atlas for nine global locations considered to be of importance for possible future naval operations (adversary encounters) in this century. The nine operational areas are located in or near the Norwegian Sea, the northern North Atlantic west of Scotland, the eastern Mediterranean west of Cyprus, the Japan Sea off

Korea, the Gulf of Aden off Saudi Arabia, the southeastern North Atlantic off Guinea, the North Pacific off the Aleutians, the Caribbean south of Cuba, and the Malacca Straits southeast of Singapore. Worst season (wind and waves) atmospheric and surface environmental data are included for each area. GRA

N80-19724# Florida State Univ., Tallahassee. Dept. of Oceanography.
EQUATORIAL PACIFIC OCEAN VARIABILITY: SEASONAL AND EL NINO TIMES SCALES
John C. Kindle Sep. 1979 152 p refs
(Contract N00014-75-C-0201; Grant NSF OCE-78-00611)
(AD-A077031; TR-167) Avail: NTIS HC A08/MF A01 CSCL 08/3

A nonlinear, single-layer numerical model is used to examine the baroclinic response of the equatorial ocean to time-variable winds. The rectangular model basin extends 1,500 km south of the equator and 15,000 km zonally; open boundary conditions are employed at the southern boundary. Attention is focused on the equatorially trapped wave response to symmetric, zonal time-dependent winds. The effects of mean currents, topography, coastline variation, thermodynamics and thermohaline mixing are neglected. In order to interpret the numerical solutions, analytic expressions for the vertical motion of the model pycnocline along the equator are derived from the linear theory of equatorial waves. Two types of wind distribution are considered: (1) a uniform wind across the entire basin and (2) a longitudinally bounded patch of wind stress within which the wind is uniform. The results given by the numerical model, linear theory, and the derived analytical expressions are also used to examine the general linear response of the equatorial ocean to time-variable winds as a function of the period of the forcing, the basin length and the stratification. The numerical model reproduces the observations of the average seasonal vertical displacement of the pycnocline at the eastern boundary. The analytical expressions reveal that equatorially trapped Kelvin waves excited between 180 and 120 degrees W are responsible for the large semi-annual response at the eastern boundary of the model. GRA

N80-19725# Air Force Geophysics Lab., Hanscom AFB, Mass. Meteorology Div.
CLIMATIC CHAMBER TESTS OF A SURFACE ICE ACCRETION MEASUREMENT SYSTEM Final Report
Paul Tattelman 26 Mar. 1979 50 p refs
(AF Proj. 6670)
(AD-A077022; AFGL-TR-79-0079; AFGL-AFSG-408) Avail: NTIS HC A02/MF A01 CSCL 08/12

Climatic chamber tests of an off-the-shelf ice detection system manufactured by Rosemount Engineering Company were conducted to evaluate its capability to determine ice amounts measured on cylinders. One-hour tests were run for a variety of windspeeds, temperatures, and icing conditions. Some longer duration tests, up to 17 hours, were also performed. Analysis of the data indicates that the Rosemount system is highly correlated with the mass of ice measured on the cylinders when the data are divided into freezing rain and rime icing events. The Rosemount system is also highly correlated with ice thickness, but without the pronounced dependence upon the type of icing. In the light of positive test results, a method is proposed for utilizing the Rosemount system for observing ice accretion at the Earth's surface. GRA

N80-19726# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19702A GSRS, MISSILE NUMBER 310, ROUND NUMBER B-33, 27 AUGUST 1979 Meteorological Data Report
Aug. 1979 22 p refs
(AD-A079990; ERADCOM/ASL-DR-1057) Avail: NTIS HC A02/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 19702A GSRS, Missile Number 301, Round Number B-33, are presented in tabular form. GRA

N80-19727# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19702A GSRS, MISSILE NUMBER BR-3, ROUND NUMBER B-35, 31 AUGUST 1979 Meteorological Data Report
Aug. 1979 25 p refs
(AD-A079991; ERADCOM/ASL-DR-1061) Avail: NTIS HC A02/MF A01 CSCL 04/2

Meteorological data gathered for the launching of the 19702A GSRS, Missile Number BR-3, Round Number B-35, are presented in tabular form. GRA

N80-19728# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19702A GSRS, MISSILE NUMBERS 308, 309, ROUND NUMBERS B-31, B-32, 18 AUGUST 1979 Meteorological Data Report
Aug. 1979 26 p refs
(AD-A079992; ERADCOM/ASL-DR-1055) Avail: NTIS HC A03/MF A01 CSCL 04/2

Meteorological data gathered for the launching of the 19702A GSRS, Missile Numbers 308, 309, Round Numbers B-31, B-32, are presented in tabular form. GRA

N80-19729# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19306B GSRS, MISSILE NUMBERS 1043, 1045, ROUND NUMBERS V-64, V-65, 17 AUGUST 1979 Meteorological Data Report
Aug. 1979 36 p refs
(AD-A079993; ERADCOM/ASL-DR-1054) Avail: NTIS HC A03/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 19306B GSRS, Missile Numbers 1043, 1045, Round Numbers V-64, V-65, are presented in tabular form. GRA

N80-19730# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19702A GSRS, MISSILE NUMBER 004, ROUND NUMBER B-30, 17 AUGUST 1979 Meteorological Data Report
Aug. 1979 22 p refs
(AD-A079999; ERADCOM/ASL-DR-1053) Avail: NTIS HC A02/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 19702A GSRS, Missile Number 004, Round Number B-30, are presented in tabular form. GRA

N80-19731# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19702D GSRS, MISSILE NUMBER 023, ROUND NUMBER B-38, 8 SEPTEMBER 1979 Meteorological Data Report
Sep. 1979 22 p refs
(AD-A080000; ERADCOM/ASL-DR-1065) Avail: NTIS HC A02/MF A01 CSCL 04/2

Meteorological data gathered for the launching of the 19702D GSRS, Missile Number 023, Round Number B-38 are presented in tabular form. GRA

N80-19732# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 12821A LANCE, MISSILE NUMBER 4819, ROUND NUMBER 335 NCL, 13 AUGUST 1979 Meteorological Data Report
Aug. 1979 27 p refs
(AD-A079995; ERADCOM/ASL-DR-1052) Avail: NTIS HC A23/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 12821A LANCE, Missile Number 4819, Round Number 335 NCL, are presented by tabular forms. GRA

N80-19733# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19702A GSRS, MISSILE NUMBER 311, ROUND NUMBER B-39, 10 SEPTEMBER 1979: METEOROLOGICAL DATA REPORT
Sep. 1979 22 p refs
(AD-A080001; ERADCOM/ASL-DR-1067) Avail: NTIS HC A02/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 19702A

GSRS, missile number 311, round number B-39 are presented in tabular form. GRA

N80-19734# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19304D GSRS, MISSILE NUMBER 1063, ROUND NUMBER V-67, 29 AUGUST 1979: Meteorological Data Report
Aug. 1979 19 p refs
(AD-A080062; ERADCOM/ASL-DR-1058) Avail: NTIS HC A02/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 19304D GSRS, missile number. 1063, round number V-67, are presented in tabular form. GRA

N80-19735# Utah Univ., Salt Lake City. Dept. of Meteorology.
ANALYZE, CALCULATE, AND DEVELOP TECHNIQUES FOR WEATHER SATELLITE IMAGERY DATA
Elford G. Astling and Kuo-Nan Liou Jun. 1979 132 p refs (F19628-78-C-0130; AF Proj. 6670)
(AD-A077292; AFGL-TR-79-0140; SR-1) Avail: NTIS HC A07/MF A01 CSCL 04/2

In conjunction with the inference of cloud composition and structure from satellites in all weather conditions, four synoptic cases including severe local storms, tropical disturbances, summertime convection and wintertime mid-latitude cyclones were selected. These cases occurred over the United States during periods when microwave and infrared satellite data from Nimbus VI satellite were available. Detailed studies of some dynamic and synoptic aspects of these cases were carried out. ESMR (Electronically Scanning Microwave Radiometer), SCAMS (Scanning Microwave Spectrometer) and THIR (Temperature Humidity Infrared Radiometer) data from the Nimbus VI satellite were documented along with the conventional atmospheric parameters. The organized microwave and infrared data and corresponding synoptic, radiosonde and cloud data are fundamental to the understanding and verification of the cloud sounding technique from satellites. GRA

N80-19736# Florida State Univ., Tallahassee. Dept. of Statistics.
RANDOMIZATION TESTS IN SUPPORT OF SOME STATISTICAL ANALYSES OF A WEATHER MODIFICATION EXPERIMENT
Ralph A. Bradley and Elton Scott Oct. 1979 19 p refs (Contract N00014-76-C-0394)
(AD-A076336; FSU-Statistics-M521; TR-149-ONR) Avail: NTIS HC A02/MF A01 CSCL 04/2

The validities of analyses of variance and covariance applied to weather modification experimental data are examined through Monte Carlo samplings of the corresponding randomization distributions. It is found that the parametric tests approximate the randomization distributions well. Thus the use of parametric procedures in exploratory analyses of weather modification data, after appropriate transformation, is justified. The authors comment also on the issue of multiplicity of analyses in data explorations. It is pointed out that analyses that are closely related and explore inherent sources of experimental variation are unlikely to result in misleading conclusions. GRA

N80-19737# Texas A&M Univ., College Station. Dept. of Meteorology.
A COMPARATIVE ANALYSIS OF RAWINSONDE AND NIMBUS-6 AND TIROS-N SATELLITE PROFILE DATA Summary Report
James R. Scoggins, William E. Carle, Keith Knight, Vance Moyer, and Nine-Min Leung Dec. 1979 85 p refs (Grant DAAG29-76-G-0078)
(AD-A079295; ARO-13520.6-GSX) Avail: NTIS HC A05/MF A01 CSCL 04/2

This report addresses the question regarding the extent to which satellite sounding data can be used to determine atmospheric structure. Comparisons are made between rawinsonde and satellite profiles in seven areas for a wide range of surface and weather conditions. Variables considered consist of temperature, dewpoint temperature, thickness , precipitable water, lapse rate of temperature, stability, geopotential height, mixing ratio, wind directions, wind speed, and kinematic parameters including vorticity and the advection of vorticity and temperature. In addition, comparisons are made in the form of cross sections and synoptic fields for selected variables. GRA

N80-19738# Texas A&M Univ., College Station. Dept. of Meteorology.
THE DETERMINATION OF ATMOSPHERIC STRUCTURE FROM QUANTITATIVE SATELLITE DATA Final Report, Jan. 1976 - Aug. 1979
James R. Scoggins Dec. 1979 8 p (Grant DAAG29-76-G-0078)
(AD-A078980; ARO-13520.7-ASX) Avail: NTIS HC A02/MF A01 CSCL 04/2

The question regarding the extent to which satellite sounding data can be used to determine atmospheric structure was addressed. Comparisons were made between rawinsonde and satellite profiles in seven areas for a wide range of surface and weather conditions. Variables considered consist of temperature, dewpoint temperature, thickness, precipitable water, lapse rate of temperature, stability, geopotential height, mixing ratio, wind direction, wind speed, and kinematic parameters including vorticity and the advection of vorticity and temperature. In addition, comparisons are made in the form of cross sections and synoptic fields for selected variables. Sounding data from both the NIMBUS-6 and TIROS-N satellites were used. The NIMBUS-6 data were linearly interpolated in order to obtain soundings coincident in time with the rawinsonde soundings. The TIROS-N data were obtained concurrently with the rawinsonde data and no interpolation was performed. Geostrophic wind computed from smoothed geopotential heights provided large-scale flow patterns that agreed well with the rawinsonde wind fields. Surface wind patterns as well as magnitudes computed by use of the log law to extrapolate wind to a height of 10 m agreed well with observations. The results of this study demonstrate rather conclusively that satellite profile data can be used to determine characteristics of large-scale systems, but that small-scale features such as frontal zones cannot yet be resolved satisfactorily. GRA

N80-19739# Colorado State Univ., Fort Collins.
TROPICAL CYCLONE ORIGIN, MOVEMENT, AND INTENSITY CHARACTERISTICS BASED ON DATA COMPOSITING TECHNIQUES Final Report
William M. Gray Aug. 1979 130 p refs (Contract N00228-76-C-2129; WF52551792)
(AD-A078624; NEPRF-CR-79-06) Avail: NTIS HC A07/MF A01 CSCL 04/2

Up-to-date results of recent tropical cyclone research at Colorado State University are presented. Particular attention is paid to new findings which impact on tropical cyclone analysis and forecasting efforts. Observational studies using large amounts of composited rawinsonde, satellite, and aircraft flight data have been performed to analyze global aspects of tropical cyclone occurrences, physical processes of tropical cyclone genesis, tropical cyclone intensity change, environmental factors influencing tropical cyclone turning motion 24-36 hours before the turn takes place, tropical cyclone intensity determination from upper tropospheric reconnaissance, and the diurnal variations of vertical motion in tropical weather systems. GRA

N80-19740# SRI International Corp., Arlington, Va.
THE LONG TERM IMPACT OF ATMOSPHERIC CARBON DIOXIDE ON CLIMATE
G. MacDonald, H. Abarbanel, and P. Carruthers Apr. 1979 184 p refs (Contract EY-76-C-03-0115)
(SAN/115-136/2; JSR-78-07d) Avail: NTIS HC A09/MF A01

The sources of atmospheric CO2 are studied and the distribution of the present CO2 among the atmospheric, oceanic, and biospheric reservoir is addressed. The impact on climate as reflected by the average ground temperature at each latitude of significant increases in atmospheric CO2 is assessed via an analytic model of the atmosphere. Calculation with this zonally averaged model shows an increase of average surface temperature of 2.4 deg for a doubling of CO2. The equatorial temperature increases by 0.7 K, while the poles warm up by 10 to 12 K. Effects of the warming of the climate are discussed. DOE

N80-19741# Air Force Geophysics Lab., Hanscom AFB, Mass. Meteorology Div.
CIRCUS PARTICLE DISTRIBUTION STUDY, PART 5 Air Force Surveys in Geophysics Interim Scientific Report
Ian D. Cohen 13 Jul. 1979 81 p *ref*
(AF Proj. 317J)
(AD-A077361; AFGL-TR-79-0155-Pt-5; AFGL-AFSG-414-Pt-5) Avail: NTIS HC A05/MF A01 CSCL 04/2

On 19 March 1978 an MC-130E aircraft obtained ice particle data in cirrus clouds near Albuquerque, N.M. Some data were also obtained from a high altostratus layer below the cirrus. Printouts of particle size and average number distribution for consecutive 30-sec periods during the flight are presented. Additionally, graphical displays of average particle spectra and 2-D particle examples are given for five 3- to 5-min periods when cloud conditions were relatively homogeneous. GRA

N80-19742# General Accounting Office, Washington, D. C. Community and Economic Development Div.
FEDERAL WEATHER MODIFICATION EFFORTS NEED CONGRESSIONAL ATTENTION
1 Nov. 1979 43 p
(PB80-106511; CED-80-5) Avail: NTIS HC A03/MF A01 CSCL 04B

Rainfall augmentation project are used to illustrate problems of weather modification programs. Results show a national weather modification research and development policy and that a program be developed with goals, objectives, priorities, and milestones should be defined. GRA

N80-19743# Virginia Highway and Transportation Research Council, Charlottesville.
ANALYZING HISTORICAL METEOROLOGICAL DATA FOR AIR QUALITY ANALYSIS Final Report, Jul. 1977 - Jun. 1979
Samuel F. Curling and Ronald L. Heisler Jun. 1979 36 p refs Sponsored in part by DOT
(PB80-107154; VHTRC-79-R54; FHWA/VA-79-R54) Avail: NTIS HC A03/MF A01 CSCL 04B

The development of three computer programs for analyzing historical meteorological data is described. The programs allow the computation of atmospheric stability categories by either of two recognized algorithms and admit the processing of temperature data as well as wind data. These programs were designed to aggregate and then analyze meteorological data on a season and hour of day basis. GRA

N80-19744# National Technical Information Service, Springfield, Va.
WEATHER MODIFICATION EFFECTS AND MANAGEMENT. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Oct. 1979
Robena J. Brown Dec. 1979 266 p Supersedes NTIS/PS-78/1226; NTIS/PS-77/1106; NTIS/PS-76/0931; NTIS/PS-75/722; NTIS/PS-75/078
(PB80-802796; NTIS/PS-78/1226; NTIS/PS-77/1106; NTIS/PS-76/0931; NTIS/PS-75/722; NTIS/PS-75/078) Avail: NTIS HC $30.00/MF $30.00 CSCL 04B

The bibliography cites Government sponsored research reports concerning adverse and beneficial effects, effect on climate, legal aspects, ecological effects, and effect on water supplies. Studies related to the management and utilization of weather modification to increase the water supply in arid regions are included. Topics dealing with the theory of cloud seeding and precipitation nucleation are excluded. This updated bibliography contains 260 abstracts, 33 of which are new entries to the previous edition. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N80-19745# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
COASTAL WATER TEMPERATURE IN THE SOUTHEASTERN PORTION OF BRAZIL UTILIZING OCEANOGRAPHIC DATA AND NOAA SENSOR DATA, VOLUME 2 [TEMPERATURAS DAS AGUAS DA COSTA SUDESTE DO BRASIL, OBTIDAS ATRAVES DE DADOS OCEANOGRAFICOS E DE DADOS DE SERIE NOAA - VOLUME 2]
Hector Manuel Inostroza Villagra and Jose Luiz Stech Sep. 1979 210 p In PORTUGUESE; ENGLISH summary Revised
(INPE-1569-RPE/070-Vol-2) Avail: NTIS HC A10/MF A01

A detailed analysis of 350 oceanographic stations resulted in the discovery of a marked seasonal tendency in the vertical temperature structure of the waters. A correlation was established between the surface and vertical thermal structure. With data from the global operational sea surface temperature computations experiment, temperature charts at the depth of 50 m were done for the four seasons of the year. K.L.

N80-19746# Naval Postgraduate School, Monterey, Calif.
REPRESENTATION OF HYDROGRAPHIC SURVEYS AND OCEAN BOTTOM TOPOGRAPHY BY ANALYTICAL MODELS M.S. Thesis
Alan J. Pickrell Sep. 1979 111 p *refs*
(AD-A078282) Avail: NTIS HC A06/MF A01 CSCL 08/10

Hydrographic surveys for nautical charting contain many discrete data points. Analytical models for ocean bottom topography could save computer storage and reduce the complexity of automating the nautical charting process, but they must meet stringent accuracy requirements. Polynomials, double Fourier series, finite elements, Duchon's analysis, Shepard's formula and Hardy:s multiquadric analysis were investigated as possible modeling techniques. Multiquadric analysis in which the surface is represented by an analytical summation of mathematical surfaces such as cones and hyperboloids was the only method found to be suitable. An iterative method of model point selection was found to give the best results. Smooth and unambiguous junctions of adjacent models were made by using a Hermite polynomial weighted sum of overlapping areas. Highly irregular surfaces can be represented by about 20% of the original survey data points; more regular bottom topography can be represented by a smaller percentage. GRA

N80-19747# Naval Postgraduate School, Monterey, Calif.
THE EVALUATION OF DULL BEAM ECHO SOUNDERS IN HYDROGRAPHIC SURVEYING M.S. Thesis
Dean Robert Seidel Sep. 1979 85 p refs
(AD-A078273) Avail: NTIS HC A05/MF A01 CSCL 17/1

A limited area hydrographic survey was conducted in shallow water, using a launch equipped to sound concurrently with three beam widths, in order to evaluate the benefits of dual beam echo sounders. The narrow beam echo sounder has become commonplace in hydrographic surveying. This has reduced the bottom area insonified by the echo sounder's beam, which decreases the probability of detecting navigational hazards. The dual beam echo sounder, equipped with a narrow and wide beam, sounding concurrently, represents a relatively inexpensive means to increase the detection capabilities, while preserving the narrow beam operation. The wide beams detected significant peaks that were absent on the narrow beam trace. The wider hyperbolic returns of the wide beams served to emphasize the narrow beam returns over features with little horizontal extent. The narrow versus wide beam depth differences over feature peaks were found useful in isolating the peak's apex. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N80-19748*# National Aeronautics and Space Administration, Washington, D. C.
EFFECT OF HABITUATION ON THE SUSCEPTIBILITY OF THE RAT TO RESTRAINT ULCERS
M. S. Martin, F. Martin, and R. Lambert Mar. 1980 12 p refs Transl. into ENGLISH from Compt. Rend. Soc. Biol. (France), v. 164, no. 4, 1970 p 826-828 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original Doc. prepared by Hopital Edouward Heriott, Lyon
(Contract NASw-3199)

(NASA-TM-76072) Avail: NTIS HC A02/MF A01 CSCL 06C

The frequency and gravity of restraint ulcers were found to significantly diminish in rats previously exposed to brief periods of immobilization. The rats' becoming habituated to restraint conditions probably explains this phenomenon. R.E.S.

N80-19748*# National Aeronautics and Space Administration, Washington, D. C.

NASA STANDARD PROCEDURES FOR THE MICROBIOLOGICAL EXAMINATION OF SPACE HARDWARE

Feb. 1980 31 p refs

(NASA-TM-80756; NHB-5340.1B) Avail: NTIS MF A01; SOD HC CSCL 06B

Microbiological assay procedures are described which assess the degree of microbial contamination of intramural environments where spacecraft hardware is assembled, tested and launched and also assess the level of microbial contamination on spacecraft hardware in relation to the known or anticipated environments of the target planets. It is emphasized that uniformity of procedures is of primary importance. However, portions of these procedures are written to include a degree of flexibility in that alternate techniques are described. Any change in these procedures, other than those specifically mentioned in alternate sections, is considered a deviation. R.C.T.

N80-19750*# National Aeronautics and Space Administration, Washington, D. C.

EFFECT OF GRADED PHYSICAL LOAD ON THE STATE OF THE LIVER FROM MORPHOMETRIC DATA AND BIOCHEMICAL BLOOD INDICES OF RATS AGAINST A BACKGROUND OF HYPOKINESIA

B. A. Nikityuk, B. I. Kogan, V. A. Yermolyev, and L. V. Tindare Feb. 1980 8 p refs Transl. into ENGLISH from Patol. Fiziol. Eksp. Ter. (USSR), no. 4, Jul. - Aug. 1978 p 32-35 Transl. by Kanner (Leo) Associates, Redwood City, Calif.

(Contract NASw-3199)

(NASA-TM-75969) Avail: NTIS HC A02/MF A01 CSCL 06C

Tests were conducted on 100 sexually immature inbred August and Wistar male rats in order to determine the effects hypokinesia, physical load and phenamine on the liver. Weight and linear dimension fell in hypokinesia; total serum protein lowered and aldolase and cholesterol and beta-lipoprotein levels rose. Blood sugar content rose and liver glycogen fell. Interlinear differences of these indices are found. Rehabilitated physical loading against hypokinesia background diminished and at times completely prevented its negative effect. Extent of correction depended on animal species. Evidence of genotypical conditionality of organism adaptation to physical load in hypokinesia was found. R.E.S.

N80-19751*# National Aeronautics and Space Administration, Washington, D. C.

EFFECTIVENESS OF USING THYROCALCITONIN FOR THE PREVENTION OF A CALCIUM METABOLIC DISORDER IN THE MINERALIZED TISSUES OF RABBITS WITH 30 DAYS HYPOKINESIA

A. I. Volozhin, V. S. Shashkov, B. S. Dmitriyev, B. B. Yegorov, V. I. Lobachik, and A. I. Brishin Mar. 1980 11 p refs Transl. into ENGLISH from Patol. Fiziol. Eksp. Ter. (USSR), v. 10, no. 2, May 1974, p 42-46 Transl. by Kanner (Leo) Associates, Redwood City, Calif.

(Contract NASw-3199)

(NASA-TM-75987) Avail: NTIS HC A02/MF A01 CSCL 06C

A 30 day hypokinesia in rabbits led to a considerable lag in weight gain for the skeletal bones, reduction in Ca45 uptake, and an increase in isotope resorption rate in the rapidly metabolized fraction of extremity bones. On the other hand, Ca45 content in the teeth and maxillae increased, which may be explained by redistribution of isotope among the various mineralized tissues. Injection of thyrocalcitonin (50 IU/day) produced a distinct normalizing effect on Ca45 uptake and resorption in the mineralized tissues of rabbits kept hypokinetic. Author

N80-19752*# National Aeronautics and Space Administration, Washington, D. C.

DYNAMICS OF ERYTHROCYTE COUNT, HEMOGLOBIN, AND CATALASE ACTIVITY IN RAT BLOOD IN HYPOKINESIA, MUSCULAR ACTIVITY AND RESTORATION

G. V. Taneyeva, G. M. Potapovich, N. A. Voloshko, and A. B. Uteshev Feb. 1980 8 p refs Transl. into ENGLISH from Izv. Akad. Nauk Kaz. SSR, Ser. Biol., (USSR), no. 1, 1979 p 71-74 Transl. by Kanner (Leo) Associates, Redwood City, Calif.

(Contract NASw-3199)

(NASA-TM-76058) Avail: NTIS HC A02/MF A01 CSCL 06C

Tests were conducted to prove that muscular exertion (in this instance swimming) of different duration and intensity, as well as hypodynamia, result in an increase of hemoglobin and number of red blood cells in peripheral blood rats. Catalase activity increased with an increase in the duration of swimming, but only up to 6 hr; with 7-9 hr of swimming as well as in hypodynamia, catalase activity decreased. It was also observed that under hypodynamia as well as in 3, 5 and 6 hr exertion (swimming) the color index of blood decreased. Pressure chamber treatment (for 8 min each day for one week), alternating a 2 min negative pressure up to 35 mm Hg with 1 min positive pressure, increased the erythrocyte count and hemoglobin content. R.E.S.

N80-19753*# National Aeronautics and Space Administration, Washington, D. C.

STATE OF THE MINERAL COMPONENT OF RAT BONE TISSUE DURING HYPOKINESIA AND THE RECOVERY PERIOD

A. I. Volozhin, G. P. Stupakov, M. N. Pavlova, and I. Sh. Muradov Mar. 1980 8 p refs Transl. into ENGLISH from Patol. Fiziol. Eksp. Ter., (USSR), no. 2, 1979 p 30-33 Transl. by Kanner (Leo) Associates, Redwood City, Calif.

(Contract NASw-3199)

(NASA-TM-76059) Avail: NTIS HC A02/MF A01 CSCL 06C

Experiments were conducted on young growing rats. Hypokinesia lasting from 20 to 200 days caused retarded gain in weight and volume of the femur and delayed development of the cortical layer of the diaphysis. In contrast, the density of the cortical layer of the femoral diaphysis increased due to elevation of the mineral saturation of the bone tissue microstructures. Incorporation of Ca into the bone tissue in hypokinesia had a tendency to reduce. Partial normalization of the bone tissue mineral component occurred during a 20 day recovery period following hypokinesia. R.E.S.

N80-19754*# National Aeronautics and Space Administration, Washington, D. C.

REACTION OF CHICKENS TO GRADUATED LENGTH OF EXPOSURE TO STRESS

J. Nvota, A. Grom, and A. Faberova Mar. 1980 14 p refs Transl. into ENGLISH from Biologia (Bratislava)(Czechoslovakia), v. 25, no. 11, 1970 p 797-803 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Slovak Acad. of Sci. and the Res. Inst. for Poultry breeding

(NASA-TM-76071) Avail: NTIS HC A02/MF A01 CSCL 06C

The reactions of 60 day old chickens Arbor Acres 60 X Vantress to immobilization stress lasting 1/2, 1, 2, 4 hours and to application of ACTH, manifested by activity changes in the systems hypophysis-adrenal gland and hypophysis-thyroid gland were studied. The highest activity increase in the two neuroendocrine systems of the chickens was found to occur after 1/2 hour exposure to stress. With prolonged stress the responses weakened and after 4 hours most of the values gradually regressed to their initial level. The responses of both systems were synchronized. Reactions of the chickens differed from those of laboratory rats in which an increased activity of the hypophysis-adrenal gland system coincided with attenuation of the hypophysis-thyroid gland system. R.E.S.

N80-19755# Joint Publications Research Service, Arlington, Va.

USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, V. 14, NO. 1

O. G. Gazenko, ed. 5 Mar. 1980 148 p refs Transl. into ENGLISH of Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow) 88 p
(JPRS-75251) Avail: NTIS HC A07/MF A01

Physiological and biological effects of manned space flight are considered with emphasis on long duration space flight. Reactions to altering work-rest cycles, hypocia, hypokinesia, and to head-pelvis accelerations are among the topics covered. For individual titles, see N80-19756 through N80-19777.

N80-19756# Joint Publications Research Service, Arlington, Va.
SCHEDULING WORK AND REST PERIODS DURING LONG-TERM SPACE FLIGHTS c54
B. S. Alyakrinskiy *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1 (JPRS-75251) 5 Mar. 1980 p 1-14 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 3-8 (For primary document see N80-19755 10-51)
Avail: NTIS HC A07/MF A01

A brief survey of space ergonomics, a field of science studying man's work capacity and methods of increasing efficiency is given. Emphasis is placed on the proper arrangement of work-rest cycles of crewmembers in long-duration space flight in order to optimize cosmonauts' activities in space. The usefulness of the laws of biorhythmology is also discussed. It is recommended that work-rest cycles in a prolonged space flight be arranged on a 24 hour basis with a normal day-night alternation, including an 8 hour night sleep and a 2 hour day rest. J.M.S.

N80-19757# Joint Publications Research Service, Arlington, Va.
EFFECTS OF FLIGHTS DIFFERING IN DURATION ON PROTEIN COMPOSITION OF COSMONAUTS BLOOD c52
Ye. V. Guseva and R. Yu. Tashpulatov *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, (JPRS-75251) 5 Mar. 1980 p 15-20 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 13-17 (For primary document see N80-19755 10-51)
Avail: NTIS HC A07/MF A01

Adaptive changes in the protein composition of cosmonaut's blood detected after space flights of varying duration are examined. A short-term 2 day flight induced a decline of gamma-globulin (immunoglobulins G and A) and beta 2-glycoprotein fractions. Longer-term 16 and 18 day flights caused an increase in albumin and most globulin fractions. A long duration 49 day flight brought about an increase in the content of C sub 3c and C sub 4 factors of the complement and immunoglobulins G, A, and M. It is shown that return of the blood protein composition to normal after prolonged space flights takes a long period of time. J.M.S.

N80-19758# Joint Publications Research Service, Arlington, Va.
EFFECTS OF UNUSUAL SCHEDULES OF DAILY ACTIVITY AND SLEEP DEPRIVATION ON MAN'S FUNCTIONAL STATE AND WORK FITNESS c54
A. N. Litsov and I. F. Sarayev *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, (JPRS-75251) 5 Mar. 1980 p 21-29 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 17-23 (For primary document see N80-19755 10-51)
Avail: NTIS HC A07/MF A01

Physiological functions, work capacity, and sleep characteristics of six healthy test subjects were studied for 30 days. The test subjects adhered to one of the three different regiments, (1) sleep from 2.00 a. m. to 10.00 a. m., (2) sleep from 6.00 p. m. to 2.00 a. m., and (3) sleep from 10.00 a. m. to 6.00 p. m. which were aggravated by 64 hr or 72 hr vigilance during the experiment. Demonstrated general and specific changes in physiological functions, work capacity and sleep are shown to be associated with how far work-rest cycles were shifted and how long they were applied. Prolonged vigilance caused similar changes in physiological functions, work capacity, and sleep. The test subjects showed very poor tolerance to an alteration in the work-rest cycle combined with sleep deprivation. J.M.S.

N80-19759# Joint Publications Research Service, Arlington, Va.
EFFECTS OF LONG-TERM SPACE FLIGHTS ON REACTIONS OF ADRENAL CORTEX AND MEDULLA
R. Kvetnyanski, R. A. Tigranyan, T. Torda, D. Repchekova, Ye. Yakhnova, and K. Murgash *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, (JPRS-75251) 5 Mar. 1980 p 30-35 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 24-27 (For primary document see N80-19755 10-51)
Avail: NTIS HC A07/MF A01

Concentrations of corticosteron and catecholamines, and activities of catecholamine synthesizing enzymes, tyrosine hydroxylase, dopamine-beta-hydroxylase, and phenyl ethanol amine-N-methyl-transferase, were measured in the adrenals of rats flown for 19.5 days abroad the biosatellite Cosmos-782, synchronous and vivarium control animals sacrified on R + 0 and R + 26 days. The flown rats showed a moderate but significant increase in the adrenal weight, corticosteron concentration, and tyrosine hydroxylase activity on R + 0 day. These parameters returned to the normal on R + 26 day. These data give evidence that the adrenocortical and sympathoadrenal systems were not significantly stimulated by the space flight effects; therefore, weightlessness cannot be considered as a potent stressful agent. J.M.S.

N80-19760# Joint Publications Research Service, Arlington, Va.
CARDIOVASCULAR REACTION TO PERIODIC HEAD-PELVIS ACCELERATIONS ON A SHORT-ARM CENTRIFUGE c52
I. F. Vil-Vilyams and Ye. B. Shulzhenko *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, (JPRS-75251) 5 Mar. 1980 p 36-42 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 27-31 (For primary document see N80-19755 10-51)
Avail: NTIS HC A07/MF A01

A result of 370 experiments in a 2 m-arm centrifuge, high human tolerance to acceleration of +0.8, 1.2, and 1.6 Gz (at the level of feet) was demonstrated. Cardiovascular reactions depended on the value, duration, and frequency of acceleration exposures. Cardiovascular responses included, primarily, changes in regional circulation of the legs. Author

N80-19761# Joint Publications Research Service, Arlington, Va.
REACTION OF HUMAN BLOOD TO CHRONIC EXPOSURE TO LOW DOSES OF CARBON MONOXIDE IN A CONFINED ENVIRONMENT c52
V. V. Zhuravlev, Z. M. Karelina, Ye. I. Nikitin, and V. P. Savina *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, (JPRS-75251) 5 Mar. 1980 p 43-48 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 43-48 (For primary document see N80-19755 10-51)
Avail: NTIS HC A07/MF A01

The morphology, biochemistry, and acid-base equilibrium of blood of test subjects during chronic exposure to low doses of carbon monoxide in an enclosed environment was studied.R.E.S.

N80-19762# Joint Publications Research Service, Arlington, Va.
PROBABILITY OF ALTITUDE DECOMPRESSION DISORDERS WHEN BREATHING OXYGEN CONTAINING HUMAN WASTE GASES c52
A. V. Sedov, A. N. Mazin, and N. A. Surovtsev *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, (JPRS-75251) 5 Mar. 1980 p 49-53 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 36-39 (For primary document see N80-19755 10-51)
Avail: NTIS HC A07/MF A01

The probability of altitude decompression disease in a hypobaric oxygen environment containing gaseous human wastes was explored. It was found that the development of the disease does not depend on the presence of wastes in the environment. Its frequency increases with exercises. The decrease of the barometric pressure to 308 mm Hg causes decompression disease only in the test subjects having traumatized limbs. The fre-

quency of the disease during further decrease in the pressure down to 198 mm Hg increases substantially. R.E.S.

N80-19763# Joint Publications Research Service, Arlington, Va.

EFFECT OF HYPEROXIA ON OXYGEN TRANSPORT PROPERTIES OF BLOOD c52

L. A. Ivanov and N. D. Chebotarev *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, (JPRS-75251) 5 Mar. 1980 p 54-59 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 39-42 (For primary document see N80-19755 10-51)

Avail: NTIS HC A07/MF A01

In nine normal test subjects, aged 19-32, pO2, pCO2 and pH of arterial and venous blood were measured. The curve of oxyhemoglobin dissociation during 20 min inhalation of a 95% O2 containing mixture was analyzed. The studies demonstrate that during hyperoxia there is a shift to the left of the dissociation curve in native blood and standard curve (i.e., normalized to pH 7.4). This shift of the curve of oxyhemoglobin dissociation indicating an increase in hemoglobin affinity for oxygen seems to be one of the factors responsible for an increase in the pO2 arteriovenous difference and a much lower increment of venous pO2 than that of arterial pO2. Author

N80-19764# Joint Publications Research Service, Arlington, Va.

EXTERNAL RESPIRATION AND ACID-BASE BALANCE OF HUMAN BLOOD DURING LONG-TERM ANTIORTHOSTATIC HYPOKINESIA AND IN THE RECOVERY PERIOD c52

A. P. Golikov, V. Ye. Vorobyev, V. R. Abdrakhmanov, L. L. Stazhadze, V. V. Bogomolov, and S. C. Voronina *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, (JPRS-75251) 5 Mar. 1980 p 60-66 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 42-46 (For primary document see N80-19755 10-51)

Avail: NTIS HC A07/MF A01

The external respiration and acid-base equilibrium of blood of 35 test subjects exposed to 49 day head-down (-4 deg) tilting and of 6 test subjects exposed to 182 day head-down (-4 deg) tilting was studied. The investigation found that a trend for a decrease in the respiration rate, lung ventilation, oxygen consumption occurred along with a relative increase in the exhalation time. With respect to the arterialized blood gases, a significant decrease in Pa sub O2, an increase in Pa sub CO2, and in the O2 alveolar-arterial difference were seen during the 49 day head-down tilting. During the 182 day head-down tilting a further increase in the CO2 arterio-alveolar difference was noted. These changes suggest shifts of the ventilation-perfusion ration in the lungs and, probably, disturbances of central regulation of respiration induced by head-down tilting. During the recovery period the above changes diminished gradually and disappeared by the 14th and 30th day after the 49 and 182 day head-down tilting, respectively. R.E.S.

N80-19765# Joint Publications Research Service, Arlington, Va.

DISTINCTIONS IN DEVELOPMENT OF PYROGENAL FEVER IN ANIMALS FOLLOWING PROLONGED HYPOKINESIA

P. V. Vasilyev, G. D. Glod, S. I. Sytnik, N. N. Uglova, and Y. P. Melnikova *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, (JPRS-75251) 5 Mar. 1980 p 67-72 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 46-50 (For primary document see N80-19755 10-51)

Avail: NTIS HC A07/MF A01

Experiments on rabbits with pyrogenal fever and amidopyrine injection were conducted. It was found that 15 and 30 day exposure to hypokinesia produced changes in the reactivity of thermoregulating centers -- overexcitation and depletion. These changes were more distinct after 15 day hypokinesia. R.E.S.

N80-19766# Joint Publications Research Service, Arlington, Va.

RAPID LABORATORY METHOD FOR TESTING OUTGASSING OF THERMOSTABLE PLASTICS AND RUBBER c27

V. D. Yablochkin, G. D. Solomin, V. A. Shchirskaya, N. A. Glazkova, Ye. A. Demchenko, N. Ye. Ostasheva, and E. I. Chukhno *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, (JPRS-75251) 5 Mar. 1980 p 73-79 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 50-54 (For primary document see N80-19755 10-51)

Avail: NTIS HC A07/MF A01

Time-temperature dependence of concentrations of outgassing products of polymers and rubbers was studied. Applying the principle of time-temperature equilibrium, the exposure time for a laboratory rapid study of polymers at 100 C was estimated to be 1 hr for enamels, lacquers and dyes, 1.5 hr for block and sheet polymers, 2.5 hr for sealants and rubbers, and 4 hr for textile materials, measured from the time when the preassigned temperature was achieved. The rapid method can be recommended for preliminary chemical study of polymers at the stage of their laboratory testing. Author

N80-19767# Joint Publications Research Service, Arlington, Va.

EFFECTS OF 25 AND 50 MeV PROTONS ON HUMAN PERIPHERAL BLOOD LYMPHOCYTE CHROMOSONES IN VITRO c52

A. M. Totseva, N. I. Ryzhov, V. N. Garasimfnko, and Ye. Dermendzhiyev *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, (JPRS-75251) 5 Mar. 1980 p 80-87 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 54-60 (For primary document see N80-19755 10-51)

Avail: NTIS HC A07/MF A01

The frequency and type of chromosomal abberations in human lymphocytes induced by 25, 50, 645 MeV protons and 200 kv X-rays were studied. It was shown that the yield of one-hit acentric fragments increased linearly and that of double-break aberrations increased exponentially with the irradiation dose. It was demonstrated that under the influence of radiations with high linear energy transfer the number of paired fragments increased and that of dicentrics and rings decreased. The test of total yield of chromosomal aberrations and their specific types helped to derive coefficients of relative biological effectiveness of the above irradiations. There was a quantitative correlation between the dose and yield of individual aberration types. R.C.T.

N80-19768# Joint Publications Research Service, Arlington, Va.

DEVELOPMENT OF PROGRAM FOR THE CONTROL OF THE AUTOTROPHIC COMPONENT OF AN ECOLOGICAL SYSTEM THAT IS CLOSED WITH REGARD TO EXCHANGE OF GASES c54

A. S. Nasonov and V. S. Toroptsov *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, (JPRS-75251) 5 Mar. 1980 p 88-93 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. Moscow), no. 1, 1980 p 60-63 (For primary document see N80-19755 10-51)

Avail: NTIS HC A07/MF A01

The requirements for the programmed control and performance of auotrophic and heterotrophic components of a closed ecological system were determined. Examples of pertinent computations are given. R.C.T.

N80-19769# Joint Publications Research Service, Arlington, Va.

EFFECT OF SODIUM BICARBONATE ON REACTIVITY AND TROPHICS OF VESTIBULAR ANALYZER c52

N. I. Arlashchenko *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, (JPRS-75251) 5 Mar. 1980 p 94-100 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 64-68 (For primary document see N80-19755 10-51)

Avail: NTIS HC A07/MF A01

It is shown that prevention of motion sickness by intravenous injections of sodium bicarbonate is a direct result of trophic changes or effect of the chemical on the functional activity of central formations. Significant observations and results are reported. R.C.T.

N80-19770# Joint Publications Research Service, Arlington, Va.

EVALUATION AND FORECASTING OF MENTAL FITNESS OF FLIGHT PERSONNEL IN THE PRESENCE OF NEUROSIS c53

K. K. Ioseliani *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, (JPRS-75251) 5 Mar. 1980 p 101-106 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 68-72 (For primary document see N80-19755 10-51)

Avail: NTIS HC A07/MF A01

Features of psychic functions and mental performance of flight personnel suffering from various neuroses were examined by clinical and psychological methods. The most severe and persistent changes in mental performance were found in neurasthenics. Higher mental productivity was detected in 80% of subjects with other neuroses (neurotic states and reactions, asthenic state, emotional-vegetative instability) ($P < 0.001$). R.C.T.

N80-19771# Joint Publications Research Service, Arlington, Va.

DYNAMICS OF STRESS REACTION OF RATS DURING EXPERIMENTAL HYPOKINESIA VARYING IN DURATION, AND POSSIBILITY OF CORRECTION THEREOF

L. Y. Kirichek *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, (JPRS-75251) 5 Mar. 1980 p 107-111 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 72-74 (For primary document see N80-19755 10-51)

Avail: NTIS HC A07/MF A01

The dynamic intensity of the stress reaction in rats as a function of time of restriction of movement was surveyed. The time of maximum manifestation of stress was determined and the nature of change therein under the influence of some central neurotropic agents was demonstrated. R.C.T.

N80-19772# Joint Publications Research Service, Arlington, Va.

EFFECT OF BRIEF ANTIORTHOSTATIC HYPOKINESIA ON BLOOD IMMUNOGLOBULIN CONTENT c52

N. N. Mukhina, V. V. Chestukhin, V. Ye. Katlov, and A. P. Karpov *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, (JPRS-75521) 5 Mar. 1980 p 112-115 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 74-75 (For primary document see N80-19755 10-51)

Avail: NTIS HC A07/MF A01

Proteins were assayed with antibody activity in blood samples from different organs, and the effect on levels thereof of brief antiorthostatic (head-down) hypokinesia, which simulates the acute period of adaptation to weightlessness was tested. R.C.T.

N80-19773# Joint Publications Research Service, Arlington, Va.

RAT PLASMA AND TISSUE LIPIDS AFTER A LONG-TERM SPACE FLIGHT

J. Ahlers, R. A. Tigranyan, E. Ahlers, E. Paulikova, and M. Praslicka *In its* USSR Rept.: Space Biol. and Aerospace Med., V. 14, no. 1, (JPRS-75251) 5 Mar. 1980 p 116-119 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 76-78 (For primary document see N80-19755 10-51)

Avail: NTIS HC A07/MF A01

Changes in the plasma and lipid metabolism of rats were studied one day after the rats had completed a flight aboard the Cosmos 782. The data were compared with the results of studies on animals involved in a ground based, synchronous experiment. Nonesterified fatty tissues were bioassayed. Results indicate there were changes in some parameters of lipid metabolism in rats such as signs of increased lipolysis in fatty tissue and increased mobilization of lipids. The changes in the spectrum of blood plasma and tissue lipids under the influence of prolonged weightlessness are discussed. A.W.H.

N80-19774# Joint Publications Research Service, Arlington, Va.

FUNCTIONAL CHANGES IN THE ADRENAL CORTEX DURING SIMULATION OF STRESS SITUATIONS IN THE PRESENCE OF HIGH CARBON MONOXIDE LEVELS c52

S. K. Kalandarov, V. P. Bychkov, and V. P. Savina *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, 1980 p 78-80 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 78-80 (For primary document see N80-19755 10-51)

Avail: NTIS HC A07/MF A01

Experiments conducted in a pressure chamber to study the combined effects of a high concentration of carbon monoxide, high temperature, and humidity on the functional state of the human adrenal cortex during a prolonged period are described. The experiments were a simulation of a malfunction of the life support systems during space flight. The experimental period varied from one to ninety days. The effects of these conditions upon the potassium and sodium content of erythrocytes, the blood plasma, and the glucocorticoid and mineralocorticoid functions of the adrenal cortex are discussed. A.W.H.

N80-19775# Joint Publications Research Service, Arlington, Va.

EFFECT OF HYPOXIA AND HYPERCAPNIA ON LACTATE AND PYRUVATE LEVELS IN RAT BLOOD AND MYCARDIUM

N. I. Mikhalkina *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, (JPRS-75251) 5 Mar. 1980 p 125-129 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 80-82 (For primary document see N80-19755 10-51)

Avail: NTIS HC A07/MF A01

The dynamics of the lactate and pyruvate levels of rats during brief, recurrent exposures to hypoxia and hypercapnia were studied. Changes in the glycolytic metabolism in the heart of a rat under the influence of these conditions are discussed. Changes in the blood and tissue of the left chamber of the heart versus changes in the right chamber are described. A.W.H.

N80-19776# Joint Publications Research Service, Arlington, Va.

STUDY OF RADIOPROTECTIVE EFFECT OF HIGH-INTENSITY MAGNETIC FIELDS ON MAMMALIAN CELL CULTURES c52

Z. Ye. Vnukova *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, (JPRS-75251) 5 Mar. 1980 p 130-133 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 83-84 (For primary document see N80-19755 10-51)

Avail: NTIS HC A07/MF A01

The combined effects of ionizing radiation and stationary magnetic fields on fibroblasts cultured in medium 199 and in Eagle's medium with 10% bovine serum and antibiotics are discussed. The radiation effect was evaluated according to the rate of restoration of cell division, the level of chromosomal aberrations in the first postradiation mitosis, and the cell survival. The cells were exposed to radiation from a Cs-137 source. An improvement in hematological parameters and a higher animal survival rate with a certain combination of these factors is discussed. A.W.H.

N80-19777# Joint Publications Research Service, Arlington, Va.

STUDIES OF THE EFFECTS OF STATIONARY MAGNETIC FIELDS ON RAT ERYTHRON

A. D. Pavlov, A. I. Solovyev, Yu. D. Goncharenko, and Ye. N. Pashukov *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, (JPRS-75251) 5 Mar. 1980 p 134-139 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 84-87 (For primary document see N80-19755 10-51)

Avail: NTIS HC A07/MF A01

The dynamics of erythropoiesis and erythropoietic activity of serum in rats under the influence of a stationary magnetic field are examined. Bioassayed results of the erythrocytes, reticulocytes, hemoglobin, and hematocrit are presented. The life span of erythrocytes was determined using Cr-51. Increased and/or decreases in the count of the erythrocytes, reticulocytes, hemoglobin, and hematocrit after certain periods of exposure are discussed. A.W.H.

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N80-19778 California Univ., Davis.
A CONTINUUM MODEL OF PROTEIN TRANSPORT ACROSS THE ENDOTHELIUM IN THE LUNGS AND IN THE BODY OF HUMANS Ph.D. Thesis
James Paul Kohler 1979 433 p
Avail: Univ. Microfilms Order No. 8003517

A model of protein transport between two compartments of a multiphase, porous system is developed by volume averaging the species education of continuity over each of the two phases. The equation obtained by this method contains a mass transport parameter which represents the ratio of a complex function of diffusive and convective processes to a function of purely convective transport. The transport equation is used with experimental data obtained from a group of human subjects to model transport of the blood Beta globulin transferrin (MW - 76000, labeled with the radioisotopes In113) from the vascular to the interstitial compartment in the lung and to the extravascular compartment in the body as a whole. The experimental data are obtained from normal subjects and a heterogeneous group of patients by means of a noninvasive scintillation detection technique and blood sampling.
Dissert. Abstr.

N80-19779* National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 203
Feb. 1980 58 p
(NASA-SP-7011(203)) Avail: NTIS HC E04 CSCL 06E

This bibliography lists 150 reports, articles, and other documents introduced into the NASA scientific and technical information system in January 1980.
Author

N80-19780 Royal Aircraft Establishment, Farnborough (England).
ULTRASONIC DOPPLER DIRECTIONAL BLOOD FLOW VELOCITY METER
V. S. Postnikov, L. I. Yakimenkov, Yu. N. Gusev, and P. M. Zykov 13 Oct. 1978 7 p refs Transl. into ENGLISH from Izv. vuz Priboorostroenie (USSR), v. 19, no. 4, 1976 p 5-8
(RAE-Lib-Trans-1918) Avail: Royal Aircraft Estab. Farnborough, Engl.

A principle for detecting the sense of the velocity of a blood flow using ultrasonic Doppler (USD) meters is described. The USD meter operates in single frequency, continuous-signal conditions with a combined piezoelectric sender/receiver. R.C.T.

N80-19781* National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 204
Mar. 1980 52 p
(NASA-SP-7011(204)) Avail: NTIS HC E04 CSCL 06E

This bibliography lists 140 reports, articles, and other documents introduced into the NASA scientific and technical information system in February 1980.
Author

N80-19782*# Pennsylvania State Univ., University Park.
KIDNEY CELL ELECTROPHORESIS Progress Report
Paul Todd Jan. 1980 28 p
(Contract NAS9-15584)
(NASA-CR-160555) Avail: NTIS HC A03/MF A01 CSCL 06B

The following aspects of kidney cell electrophoresis are discussed: (1) the development and testing of electrophoresis sdlutions; (2) optimization of freezing and thawing; (3) procedures for evaluation of separated kidney cells; and (4) electrophoretic mobility characterization of kidney cells.
R.E.S.

N80-19783*# National Aeronautics and Space Administration, Washington, D. C.
EFFECT OF HYPOKINESIA ON CARDIAC CONTRACTILE FUNCTION AND NERVOUS REGULATION OF THE HEART
F. Z. Meyerson, V. I. Kapelko, M. S. Gorina, A. N. Shchegolkov, and N. P. Larinov Feb. 1980 13 p refs Transl. into ENGLISH from Fiziol. Zh. SSSR, (USSR), no. 8, Aug. 1978 p 1138-1144 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75970) Avail: NTIS HC A02/MF A01 CSCL 06P

Longterm hypokinesia caused cardiac deadaptation in rabbits, which resulted in the diminishing of the left ventricular rate of contraction and relaxation, joined later by decreased vascular resistance. As a results, the ejection rate as well as stroke volume and cardiac output were normal. The decrease of the relaxation speed was more obvious at a high heart rate and results in shortening of the diastolic pause and diminishing of cardiac output. Hearts of the hypokinetic animals were characterized by normal maximal pressure developed by a unit of muccardial mass aorta clamping, decreased adrenoreactivity, and increased cholinoreactivity. This complex of changes is contrary to changes observed in adaptation to exercise, but is similar to changes observed in compensatory hypertrophy of the heart.
R.C.T.

N80-19784*# National Aeronautics and Space Administration, Washington, D. C.
ALIMENTARY HYPOKINESIA
K. S. Petrovskiy Mar. 1980 8 p Transl. into ENGLISH from Gig. Sanit. (USSR), no. 2, Feb. 1974, p 18-22 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75989) Avail: NTIS HC A02/MF A01 CSCL 06P

The problem of possible conservation of the natural activity of food products is discussed. The struggle for the preservation of the natural activity of food products is an important means of preventing the unfavorable consequences of long term hypokinesia.
R.E.S.

N80-19785*# National Aeronautics and Space Administration, Washington, D. C.
METABOLISM DURING HYPODYNAMIA
I. V. Federov Feb. 1980 29 p refs Transl. into ENGLISH from Biol. Nauki (USSR), v. 15, no. 12, 1972 p 24-36 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75996) Avail: NTIS HC A03/MF A01 CSCL 06S

Physical immobilization, inaction due to space travel, a sedentary occupation, or bed confinement due to a chronic illness elicit similar alternations in the metabolism of man and animals (rat, rabbit, dog, mouse). After a preliminary period of weight loss, there is eventually weight gain due to increased lipid storage. Protein catabolism is enhanced and anabolism depressed, with elevated urinary excretion of amino acids, creatine, and ammonia. Glycogen stores are depleted and glyconeogenesis is accelerated. Polyuria develops with subsequent redistribution of body fluids in which the blood volume of the systemic circulation is decreased and that of pulmonary circulation increased. This results in depressed production of vasopressin by the posterior pituitary which further enhances urinary water and salt loss.
Author

N80-19786*# National Aeronautics and Space Administration, Washington, D. C.
BLOOD CIRCULATION UNDER CONDITIONS OF WEIGHTLESSNESS
I. I. Kastyan and V. I. Kopanev Mar. 1980 25 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Seriya Biol. (USSR), no. 3, 1964 p 352-368 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-76036) Avail: NTIS HC A02/MF A01 CSCL 06S

Experimental materials and published data on the problem of blood circulation in man and animals under conditions of short and long term weightlessness are summarized. The data obtained allow the conclusion, that when humans spent 5 days in a weightless state their blood circulation was not essentially distributed. Some features of the functioning of the cardiovascular system are pointed out: delay of adaptation rate, increase in

lability, etc. There is a discussion of the physiological mechanisms for the direct and indirect effect of weightlessness. The direct effect comprise the complex of reactions caused by the significant fall in hydrostatic pressure and the indirect embraces all the reactions arising in the organism resulting from disturbance of the systematic character of the analyzers that take part in the analysis of space realtions and the body's orientation in space.
R.E.S.

N80-19787*# National Aeronautics and Space Administration, Washington, D. C.
CERTAIN QUESTIONS OF THE ACCLIMATIZATION OF CONSTRUCTION WORKERS TO THE CONDITIONS OF A SUBTROPICAL CLIMATE
A. Babayev Sep. 1979 11 p refs Transl. into ENGLISH from Gig. Sanit. (USSR), no. 6, 1978 p 106-108 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75728) Avail: NTIS HC A02/MF A01 CSCL 06P

The period of active acclimatization was determined for construction workers coming into a subtropical climate. Changes were observed in metabolic processes, oxygen needs, pulse rate, arterial pressure, body and skin temperature, body weight, water consumption and loss, and the comfort zone of heat sensitivity. It was concluded that acclimatization is facilitated if introduction to the hot climate occurs in the mild cool season, rather than the summer. This also prevents heat prostration and improves the development of adaptive mechanisms. Author

N80-19788# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. Aviation Vision Lab.
SPATIAL FILTERING AND MECHANISMS OF PERCEPTION
Arthur P. Ginsburg Apr. 1979 9 p refs Presented at the Conf. on Modeling and Simulation, Pittsburgh, 25-27 Apr. 1979 (AF Proj. 2313)
(AD-A077622; AMRL-TR-79-47) Avail: NTIS HC A02/MF A01 CSCL 14/5

Attempts have been made to distinguish between visual mechanisms as being space domain feature detectors or transform domain spatial frequency detectors. Those descriptions can be considered equivalent in terms of producing similar filtered images. However, Fourier-like transformation appears to be a more accurate description of the filtering process when biological data is considered. The two-dimensional discrete Fourier transform is a process that requires the input object to be multiplied by a bank of even symmetric cosinusoidal and odd symmetric sinusoidal space functions having periodicity. The periodicity corresponds to the number of cycles per receptive field width. The weighting function of the periodicity is alternating positive and negative values. These properties were related to the properties of cortical receptive fields. Certain receptive fields may functionally perform a generalized periodic analysis for spatial vision. Since these functions are two-dimensional, they are sensitive to orientation, similar to cortical receptive fields. Therefore, it was argued that the visual system contains mechanisms that can process spatial information consistent with the mathematical process of a two-dimensional discrete Fourier-like transform. This analysis of the filtering process of certain visual cortical mechanisms may lead to further understanding into visual perception. GRA

N80-19789# Naval Aerospace Medical Research Lab., Pensacola, Fla.
THE THOUSAND AVIATOR STUDY: 1969 - 1971 FOLLOW-UP PROGRAM WITH DISTRIBUTIONS AND INTERCORRELATIONS OF SELECTED VARIABLES
Neil R. MacIntyre, Albert Oberman, William Harlan, Robert E. Mitchell, and Ashton Graybiel Apr. 1979 232 p refs (AF51524005)
(AD-A079700; NAMRL-MONOGRAPH-24) Avail: NTIS HC A11/MF A01 CSCL 01/2

The 1969-1971 evaluation of the U.S. Navy's 'Thousand Aviator' program was the fourth such follow-up examination since the study's inception in 1940. During this evaluation, follow-up status was determined in 995 of the original 1056 subjects (94.2%). In addition, the largest amount of physiologic, psychologic, and other medical data collected to date in the program was obtained on the 675 subjects tested in Pensacola, Florida. As with previous evaluations of the group, a summary of the methodologies employed and an overall view of distributions and interrelationships seemed necessary for a continued understanding of the program and its findings. This report describes in detail the methodology as well as the distributions and intercorrelations of 80 selected variables. Data are presented in the form of descriptive statistics, frequency histograms, and Pearson correlation coefficients. Comments deal exclusively with statistical considerations, and no interpretations are attempted.
Author (GRA)

N80-19790# National Technical Information Service, Springfield, Va.
BIOFEEDBACK. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1966 - Dec. 1979
Elizabeth A. Harrison Dec. 1979 76 p Supersedes NTIS/PS-78/1301; NTIS/PS-77/1188; NTIS/PS-76/0999; NTIS/PS-75/885; NTIS/PS-75/025
(PB80-803117; NTIS/PS-78/1301; NTIS/PS-77/1188; NTIS/PS-76/0999; NTIS/PS-75/885; NTIS/PS-75/025) Avail: NTIS HC $30.00/MF $30.00 CSCL 05J

Research reports on self-regulation of psychological and physiological processes are cited. Studies on learned control of blood pressure, motor reactions, brain waves, heart rate, and body temperature are included. This updated bibliography contains 68 abstracts, 7 of which are new entries to the previous edition. GRA

N80-19757# Joint Publications Research Service, Arlington, Va.
EFFECTS OF FLIGHTS DIFFERING IN DURATION ON PROTEIN COMPOSITION OF COSMONAUTS BLOOD
Ye. V. Guseva and R. Yu. Tashpulatov *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, (JPRS-75251) 5 Mar. 1980 p 15-20 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 13-17 (For primary document see N80-19755 10-51)
Avail: NTIS HC A07/MF A01

N80-19760# Joint Publications Research Service, Arlington, Va.
CARDIOVASCULAR REACTION TO PERIODIC HEAD-PELVIS ACCELERATIONS ON A SHORT-ARM CENTRIFUGE
I. F. Vil-Vilyams and Ye. B. Shulzhenko *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, (JPRS-75251) 5 Mar. 1980 p 36-42 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 27-31 (For primary document see N80-19755 10-51)
Avail: NTIS HC A07/MF A01

N80-19761# Joint Publications Research Service, Arlington, Va.
REACTION OF HUMAN BLOOD TO CHRONIC EXPOSURE TO LOW DOSES OF CARBON MONOXIDE IN A CONFINED ENVIRONMENT
V. V. Zhuravlev, Z. M. Karelina, Ye. I. Nikitin, and V. P. Savina *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, (JPRS-75251) 5 Mar. 1980 p 43-48 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 43-48 (For primary document see N80-19755 10-51)
Avail: NTIS HC A07/MF A01

N80-19762# Joint Publications Research Service, Arlington, Va.
PROBABILITY OF ALTITUDE DECOMPRESSION DISORDERS WHEN BREATHING OXYGEN CONTAINING HUMAN WASTE GASES
A. V. Sedov, A. N. Mazin, and N. A. Surovtsev *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, (JPRS-75251) 5 Mar. 1980 p 49-53 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 36-39 (For primary document see N80-19755 10-51)
Avail: NTIS HC A07/MF A01

N80-19783# Joint Publications Research Service, Arlington, Va.
EFFECT OF HYPEROXIA ON OXYGEN TRANSPORT PROPERTIES OF BLOOD
L. A. Ivanov and N. D. Chebotarev *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, (JPRS-75251) 5 Mar. 1980 p 54-59 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 39-42 (For primary document see N80-19755 10-51)
Avail: NTIS HC A07/MF A01

N80-19784# Joint Publications Research Service, Arlington, Va.
EXTERNAL RESPIRATION AND ACID-BASE BALANCE OF HUMAN BLOOD DURING LONG-TERM ANTIORTHOSTATIC HYPOKINESIA AND IN THE RECOVERY PERIOD
A. P. Golikov, V. Ye. Vorobyev, V. R. Abdrakhmanov, L. L. Stazhadze, V. V. Bogomolov, and S. C. Voronina *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, (JPRS-75251) 5 Mar. 1980 p 60-66 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 42-46 (For primary document see N80-19755 10-51)
Avail: NTIS HC A07/MF A01

N80-19767# Joint Publications Research Service, Arlington, Va.
EFFECTS OF 25 AND 50 MeV PROTONS ON HUMAN PERIPHERAL BLOOD LYMPHOCYTE CHROMOSONES IN VITRO
A. M. Totseva, N. I. Ryzhov, V. N. Garasimfnko, and Ye. Dermendzhiyev *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, (JPRS-75251) 5 Mar. 1980 p 80-87 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 54-60 (For primary document see N80-19755 10-51)
Avail: NTIS HC A07/MF A01

N80-19768# Joint Publications Research Service, Arlington, Va.
EFFECT OF SODIUM BICARBONATE ON REACTIVITY AND TROPHICS OF VESTIBULAR ANALYZER
N. I. Artashchenko *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, (JPRS-75251) 5 Mar. 1980 p 94-100 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 64-68 (For primary document see N80-19755 10-51)
Avail: NTIS HC A07/MF A01

N80-19772# Joint Publications Research Service, Arlington, Va.
EFFECT OF BRIEF ANTIORTHOSTATIC HYPOKINESIA ON BLOOD IMMUNOGLOBULIN CONTENT
N. N. Mukhina, V. V. Chestukhin, V. Ye. Katlov, and A. P. Karpov *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, (JPRS-75521) 5 Mar. 1980 p 112-115 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 74-75 (For primary document see N80-19755 10-51)
Avail: NTIS HC A07/MF A01

N80-19774# Joint Publications Research Service, Arlington, Va.
FUNCTIONAL CHANGES IN THE ADRENAL CORTEX DURING SIMULATION OF STRESS SITUATIONS IN THE PRESENCE OF HIGH CARBON MONOXIDE LEVELS
S. K. Kalandarov, V. P. Bychkov, and V. P. Savina *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, 1980 p 78-80 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 78-80 (For primary document see N80-19755 10-51)
Avail: NTIS HC A07/MF A01

N80-19776# Joint Publications Research Service, Arlington, Va.
STUDY OF RADIOPROTECTIVE EFFECT OF HIGH-INTENSITY MAGNETIC FIELDS ON MAMMALIAN CELL CULTURES
Z. Ye. Vnukova *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, (JPRS-75251) 5 Mar. 1980 p 130-133 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 83-84 (For primary document see N80-19755 10-51)
Avail: NTIS HC A07/MF A01

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N80-19791*# Boeing Commercial Airplane Co., Seattle, Wash.
NASA TLA WORKLOAD ANALYSIS SUPPORT. VOLUME 1: DETAILED TASK SCENARIOS FOR GENERAL AVIATION AND METERING AND SPACING STUDIES
James L. Sundstrom Mar. 1980 38 p refs
(Contract NAS1-13741)
(NASA-CR-3199; D6-32872) Avail: NTIS HC A03/MF A01 CSCL 05H

The techniques required to produce and validate six detailed task timeline scenarios for crew workload studies are described. Specific emphasis is given to: general aviation single pilot instrument flight rules operations in a high density traffic area; fixed path metering and spacing operations; and comparative workload operation between the forward and aft-flight decks of the NASA terminal control vehicle. The validation efforts also provide a cursory examination of the resultant demand workload based on the operating procedures depicted in the detailed task scenarios. R.C.T.

N80-19792*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EFFECT OF FIELD OF VIEW AND MONOCULAR VIEWING ON ANGULAR SIZE JUDGEMENTS IN AN OUTDOOR SCENE
Edward A. Denz (San Jose State Univ., Calif.), Everett A. Palmer, and Stephen R. Ellis Feb. 1980 20 p refs
(Grant NsG-2269)
(NASA-TM-81176; A-8083) Avail: NTIS HC A02/MF A01 CSCL 05I

Observers typically overestimate the angular size of distant objects. Significantly, overestimations are greater in outdoor settings than in aircraft visual-scene simulators. The effect of field of view and monocular and binocular viewing conditions on angular size estimation in an outdoor field was examined. Subjects adjusted the size of a variable triangle to match the angular size of a standard triangle set at three greater distances. Goggles were used to vary the field of view from 11.5 deg to 90 deg for both monocular and binocular viewing. In addition, an unrestricted monocular and binocular viewing condition was used. It is concluded that neither restricted fields of view similar to those present in visual simulators nor the restriction of monocular viewing causes a significant loss in depth perception in outdoor settings. Thus, neither factor should significantly affect the depth realism of visual simulators. Author

N80-19793# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
LEARNING BY UNDERSTANDING ANALOGIES
Patrick H. Winston Jun. 1979 90 p refs
(Contracts N00014-75-C-0643; N00014-77-C-0389)
(AD-A078123; AI-M-520) Avail: NTIS HC A05/MF A01 CSCL 06/4

We use analogy when we say something is a Cinderella story and when we learn about resistors by thinking about water pipes. Experts use analogy when they learn Economics, Medicine, and Law. This paper presents a theory of analogy and describes an implemented system that embodies the theory. The specific competence to be understood is that of using analogies to deal with an unfamiliar situation. A teacher may supply the analogy or may not. The analogy may be between situations in a single domain or between situations in very different domains. Frames represent the situations. Relations are expressed in a way that is reminiscent of the case-grammar view of simple sentences. The essential computations tie pairs of frame-described situations

together and make knowledge about one become knowledge about the other. GRA

N80-19794# National Technical Information Service, Springfield, Va.
STRESS FACTORS ON PILOT PERFORMANCE. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Dec. 1979
Elizabeth A. Harrison Dec. 1979 222 p Supersedes NTIS/PS-78/1289; NTIS/PS-77/1160; NTIS/PS-76/1043; NTIS/PS-75/033
(PB80-803075; NTIS/PS-78/1289; NTIS/PS-77/1160; NTIS/PS-76/1043; NTIS/PS-75/033) Avail: NTIS HC $30.00/MF $30.00 CSCL 06S

The selected abstracts of research reports cover acceleration, circadian rhythms, physiology, psychology, neurology, man-machine systems, high altitude effects, noise effects, and vibration effects as related to stress factors on pilot performance. This updated bibliography contains 215 abstracts, 25 of which are new entries to the previous edition. GRA

N80-19813# Department of the Air Force, Washington, D.C. Tactical Systems Div.
REPRESENTING HUMAN THOUGHT AND RESPONSE IN MILITARY CONFLICT SIMULATION MODELS
Dennis K. Leedom *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 15 p refs (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

N80-19828# Defense Advanced Research Projects Agency, Arlington, Va.
AVIATION TRAINING USING VIDEO DISK TECHNOLOGY
Craig Fields and Steven Levin *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 2 p Prepared in cooperation with Interactive Television Co., Arlington, Va. (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

N80-19770# Joint Publications Research Service, Arlington, Va.
EVALUATION AND FORECASTING OF MENTAL FITNESS OF FLIGHT PERSONNEL IN THE PRESENCE OF NEUROSIS
K. K. Ioseliani *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, (JPRS-75251) 5 Mar. 1980 p 101-106 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 68-72 (For primary document see N80-19755 10-51)
Avail: NTIS HC A07/MF A01

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N80-19795*# Grumman Aerospace Corp., Bethpage, N.Y. Advanced Development Dept.
PROJECT FIRES - FIREFIGHTERS INTEGRATED RESPONSE EQUIPMENT SYSTEM. VOLUME 1: PROGRAM OVERVIEW AND SUMMARY, PHASE 1A Final Report
Fred Abeles, Arnold Bruno, Robert Delvecchio, and Victor Himel Dec. 1978 48 p
(Contract NAS8-32329)
(NASA-CR-161399; PB-299050/5) Avail: NTIS HC A03/MF A01 CSCL 06Q

Current firefighters protective equipment was tested and evaluated against the protective ensemble performance standards (PEPS) requirements. A technology demonstration ensemble (TDE) was fabricated to demonstrate how the use of advanced equipment and technology could satisfy, to the fullest extent possible, the protective needs of the firefighter described by the PEPS. The TDE utilizes innovative approaches, advanced materials and equipment, and systems integration technology. Using the results of the test program and the PEPS document, a preliminary design of a prototype protective ensemble was performed. This design features materials and components that are available now and would offer increased firefighter protection in the near future. Author

N80-19796*# Grumman Aerospace Corp., Bethpage, N.Y. Advanced Development Dept.
PROJECT FIRES - FIREFIGHTERS INTEGRATED RESPONSE EQUIPMENT SYSTEM. VOLUME 2: PROTECTIVE ENSEMBLE PERFORMANCE STANDARDS GOALS FOR FIREFIGHTER PROTECTION, PHASE 1A Final Report
Fred Abeles, Arnold Bruno, Robert Delvecchio, and Victor Himel Dec. 1978 143 p Revised
(Contract NAS8-32329)
(NASA-CR-161400; PB-299051/3) Avail: NTIS HC A07/MF A01 CSCL 06Q

The performance goals needed for the development of a structural firefighter's protective ensemble are presented. The protective ensemble is comprised of five integrated systems and provides body protection, breathing gas, cooling, illumination, and a communications capability. The performance requirements are defined along with associated methods for their evaluation. J.M.S.

N80-19797*# Grumman Aerospace Corp., Bethpage, N.Y. Advanced Development Dept.
PROJECT FIRES - FIREFIGHTERS INTEGRATED RESPONSE EQUIPMENT SYSTEM. VOLUME 3: TEST AND EVALUATION REPORT, PHASE 1A Final Report
Fred Abeles, Arnold Bruno, Robert Delvecchio, and Victor Himel Dec. 1978 94 p
(Contract NAS8-32329)
(NASA-CR-161401; PB-299052/1) Avail: NTIS HC A05/MF A01 CSCL 06Q

Existing turnout gear was evaluated against the protective ensemble performance standards (PEPS). The equipment tested included eight models of helmets, four models of eyeshields, five representative turnout coats, ten pairs of gloves, five pairs of boots, four full-up combinations of turnout gear, and one personal cooling system. Physical testing and evaluation included impact, penetration, heat, flame, and cut resistance. Human factors testing and evaluation included mobility and dexterity, grip, cold insulation, heat insulation, fit, and retention. Performance of each individual item is rated in terms of the PEPS criteria. J.M.S.

N80-19798*# Grumman Aerospace Corp., Bethpage, N.Y. Advanced Development Dept.
PROJECT FIRES - FIREFIGHTERS INTEGRATED RESPONSE EQUIPMENT SYSTEM. VOLUME 4: TECHNOLOGY DEMONSTRATION ENSEMBLE, PHASE 1A Final Report
Fred Abeles, Arnold Bruno, Robert Delvecchio, and Victor Himel Dec. 1978 24 p
(Contract NAS8-32329)
(NASA-CR-161402; PB-299053/9) Avail: NTIS HC A02/MF A01 CSCL 06Q

The Technology Demonstration Ensemble (TDE) demonstrates advanced concepts in a structural firefighter's personal protection system. This innovative design was conceived of as an integrated lightweight system that provides head-to-toes protection. Some of the features provided include: an ultralightweight breathing system built right into the turnout garment; conecpts which insure wrist, neck, and ankle protection; a helmet that incorporates a radio, public address system; and an emergency warning device. These and other features of the design are described. J.M.S.

N80-19799*# Grumman Aerospace Corp., Bethpage, N.Y. Advanced Technology Dept.
PROJECT FIRES - FIREFIGHTERS INTEGRATED RESPONSE EQUIPMENT SYSTEM. VOLUME 5: PROTOTYPE PROTECTIVE ENSEMBLE DATA PACKAGE, PHASE 1A Final Report
Fred Abeles, Arnold Bruno, Robert Delvecchio, and Victor Himel Dec. 1978 94 p refs
(Contract NAS8-32329)
(NASA-CR-161403; PB-299054/7) Avail: NTIS

HC A05/MF A01 CSCL 06Q

The preliminary design of a prototype protective ensemble for structural firefighters is presented. The protective garment system is comprised of five subsystems. Sketches and preliminary layout-type drawings used as a basis for defining the design characteristics of the protective garment subsystem are included. The design is based on the requirements of the protective ensemble performance standard, available materials characteristics, and on maintaining cost at a reasonable level. J.M.S.

N80-19800*# Life Systems, Inc., Cleveland, Ohio.
DEVELOPMENT OF A NITROGEN GENERATION SYSTEM Final Report
D. B. Heppner, R. D. Marshall, J. D. Powell, III, and F. H. Schubert Jan. 1980 63 p refs
(Contract NAS2-10096)
(NASA-CR-152333; LSI-TR-353-4) Avail: NTIS HC A04/MF A01 CSCL 06K

An eight-stage nitrogen generation module was developed. The design integrated a hydrazine catalytic dissociator, three ammonia dissociation stages and four palladium/silver hydrogen separator stages. Alternating ammonia dissociation and hydrogen separation stages are used to remove hydrogen and ammonia formed in the dissociation of hydrazine which results in negligible ammonia and hydrogen concentrations in the product nitrogen stream. An engineering breadboard nitrogen supply subsystem was also developed. It was developed as an integratable subsystem for a central spacecraft air revitalization system. The subsystem consists of the hydrazine storage and feed mechanism, the nitrogen generation module, the peripheral mechanical and electrical components required to control and monitor subsystem performance, and the instrumentation required to interface with other subsystems of an air revitalization system. The breadboard nitrogen supply subsystem was integrated and tested with a one-person capacity experimental air revitalization system. The integration, checkout and testing was successfully accomplished. R.E.S.

N80-19801*# National Aeronautics and Space Administration, Washington, D. C.
A DEVICE FOR DETERMINING THE INTENSITY OF PARTIAL SWEATING
V. A. Rayskiy, Ye. A. Vinogradov, and O. A. Safonov Mar. 1979 7 p Transl. into ENGLISH from Russian Patent no. 249546 (Appl. No. 1199884/31-16, 30 Nov. 1967) 3 p Submitted for publication Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75429) Avail: NTIS HC A02/MF A01 CSCL 06B

An invention which can measure partial perspiration is disclosed. The partial perspiration is measured with a specially shaped device tightly fastened to the body but not touching the skin area being studied. A special grid is used to keep the moisture-absorbing agent from touching the skin. R.E.S.

N80-19802*# Virginia Univ., Charlottesville. Research Labs. for the Engineering Sciences.
HUMAN COMFORT RESPONSE TO RANDOM MOTIONS WITH COMBINED YAWING AND ROLLING MOTIONS
Ralph W. Stone, Jr. Aug. 1979 129 p refs
(Contract NAS1-14908)
(NASA-CR-159187; UVA/528156/MAE-CE79/128) Avail: NTIS HC A07/MF A01 CSCL 05H

The effects of random yawing and rolling velocities on passenger ride comfort responses were examined on a visual motion simulator. The effects of power spectral density shape and frequency ranges of peak power from 0 to 2 Hz were studied. The subjective rating data and the physical motion data obtained are presented. No attempt at interpretation or detailed analysis of the data is made. There existed during this study motions in all other degrees of freedom as well as the yawing and rolling motions, because of the characteristics of the simulator. These unwanted motions may have introduced some interactive effects on passenger responses which should be considered in any analysis of the data. R.E.S.

N80-19803# Army Research Inst. for the Behavioral and Social Sciences, Alexandria, Va.
HELICOPTER PILOT DETECTION OF THE TWO DIFFERENT CAMOUFLAGED HAWK BATTERIES
Charles C. Jorgensen and Nadean R. Jones Jul. 1978 10 p refs
(AD-A077954; ARI-RM-78-5) Avail: NTIS HC A02/MF A01 CSCL 15/7

The purpose of this study was to collect data comparing the camouflage effectiveness of the cage-supported light-weight camouflage screen (LCS) and the experimental shape disrupter system produced by the Mobility Equipment Research and Development Command (MERADCOM). The camouflaged Hawk battery systems were contrasted with a control Hawk battery having no camouflage. The data reported in this paper were collected by ARI for use by the US Army Air Defense Board (ADB) as part of a larger scale study for the US Army Air Defense School (USAADS). ARI was specifically tasked with determining the human pilot detectability of the batteries in contrast to other portions of the study dealing with satellite and photoimagery interpretations. The data presented refer only to helicopter pilots and the associated Hawk ground crews. The data that were collected appear to consistently support one camouflage system over the other. GRA

N80-19804# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
TOWARD A REMOTELY-MANNED ENERGY AND PRODUCTION ECONOMY
Marvin Minsky Sep. 1979 20 p
(Contract N00014-79-C-0260)
(AD-A078069; AI-M-544) Avail: NTIS HC A02/MF A01 CSCL 05/8

We can solve many problems of energy, health, productivity, and environmental quality by improving the technology of remote control. This will produce nuclear safety and security, advances in mining, increases in productivity, economies in transportation, new industries and markets. By creating 'mechanical hands' that are versatile and economical enough, we shape a new world of health, energy and security. It will take 10 to 20 years, and cost about a billion dollars. GRA

N80-19805# Human Engineering Labs., Aberdeen Proving Ground, Md.
EFFECTS OF ARTILLERY NOISE ON THE HEARING OF PROTECTED CREW PERSONNEL Final Report, May - Jun. 1978
David C. Hodge, G. Richard Price, Nancy L. Dukes, and Samuel J. Mucff Oct. 1979 40 p refs
(DA Proj. 1L1-61102-B-74A)
(AD-A078664; HEL-TM-17-79) Avail: NTIS HC A03/MF A01 CSCL 06/19

A test was conducted to determine loading rates for three artillery systems, and both male and female crews participated. Audiometric and acoustical support were provided to assess the crews: noise exposure, look for trends in the threshold shift data, and compare the threshold shifts with that permitted under present damage risk criteria. The impulse noise exposures were quite variable, due to crew mobility and low zone charges. There were no instances of excessive threshold shift, and only a few instances of threshold shift approaching the allowable limits. There were no obvious trends across test conditions. The main auditory goal of the test, viz., to avoid excessive hearing losses, was achieved. GRA

N80-19806# Army Command and General Staff Coll., Fort Leavenworth, Kansas.
LIGHTWEIGHT PILOT HELMETS: THE ISSUE OF WEIGHT VERSUS PROTECTION M.S. Thesis Final Report
Richard W. Himmel 8 Jun. 1979 63 p refs
(AD-A076325) Avail: NTIS HC A04/MF A01 CSCL 06/17

This study addresses the problem of reducing the weight of pilot helmets while retaining relevant protective qualities. Existing helmet development standards are synthesized and compared in light of compatability, objectivity and standardization. The issue of decreased protection, as a result of weight reduction, is discussed in view of pilot opinion, accident experience, contemporary research and recent compromises in helmet development.

The investigation reveals distinct ambiguities in helmet development standards and incongruities between standards. The study recommends the deletion of penetration standards since they are incompatible with impact standards and prevent industry from using new materials to achieve light weight. Further, the study proposes a change to military specification MIL-H-83147 (USAF) that reflects the deletion of penetration standards and recognizes current technological developments. GRA

N80-19807# National Technical Information Service, Springfield, Va.
HUMAN WORK MEASUREMENT. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Nov. 1979
Edith Kenton Dec. 1979 218 p Supersedes NTIS/PS-78/1197; NTIS/PS-77/1054; NTIS/PS-76/0945; NTIS/PS-75/797 (PB80-803166; NTIS/PS-78/1197; NTIS/PS-77/1054; NTIS/PS-76/0945; NTIS/PS-75/797) Avail: NTIS HC $30.00/MF $30.00 CSCL 05I

Reports dealing with measurement techniques of human work at jobs and tasks are summarized. Specific topics included are work, analysis and evaluation, workload management, operations analysis, task complexity, and performance measurement. This updated bibliography contains 211 abstracts, 43 of which are new entries to the previous edition. GRA

N80-19808# Rhode Island Univ., Kingston. Dept. of Electrical Engineering.
GENERAL METHODS TO ENABLE ROBOTS WITH VISION TO ACQUIRE, ORIENT AND TRANSPORT WORKPIECES Technical Report 5
J. Birk, R. Kelley, and T. Brownell Aug. 1979 245 p refs (Grants NSF APR-74-13935; Grants NSF DAR-14-13935) (PB80-106388; NSF/RA-790230; TR-5) Avail: NTIS HC A11/MF A01 CSCL 13I

The problem of giving robots the ability to work with unoriented objects is discussed in relation to automated batch manufacturing systems, particularly those in which unoriented parts in containers are transported between machines and storage. Some examples of robot systems are an automatic method of visually estimating the pose of an object held in a robot hand and a system employing vision which feeds workpieces directly from supply bins into machines and which can be reprogrammed to service different workpieces. GRA

N80-19756# Joint Publications Research Service, Arlington, Va.
SCHEDULING WORK AND REST PERIODS DURING LONG-TERM SPACE FLIGHTS
B. S. Alyakrinskiy *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1 (JPRS-75251) 5 Mar. 1980 p 1-14 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 3-8 (For primary document see N80-19755 10-51)
Avail: NTIS HC A07/MF A01

N80-19758# Joint Publications Research Service, Arlington, Va.
EFFECTS OF UNUSUAL SCHEDULES OF DAILY ACTIVITY AND SLEEP DEPRIVATION ON MAN'S FUNCTIONAL STATE AND WORK FITNESS
A. N. Litsov and I. F. Sarayev *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, (JPRS-75251) 5 Mar. 1980 p 21-29 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), no. 1, 1980 p 17-23 (For primary document see N80-19755 10-51)
Avail: NTIS HC A07/MF A01

N80-19768# Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF PROGRAM FOR THE CONTROL OF THE AUTOTROPHIC COMPONENT OF AN ECOLOGICAL SYSTEM THAT IS CLOSED WITH REGARD TO EXCHANGE OF GASES
A. S. Nasonov and V. S. Toroptsov *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 14, no. 1, (JPRS-75251) 5 Mar. 1980 p 88-93 refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. Moscow), no. 1, 1980 p 60-63 (For primary document see N80-19755 10-51)
Avail: NTIS HC A07/MF A01

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N80-19809# Advisory Group for Aerospace Research and Development, Paris (France).
MODELING AND SIMULATION OF AVIONICS SYSTEMS AND COMMAND, CONTROL AND COMMUNICATIONS SYSTEMS
Jan. 1980 553 p refs Presented at the Meeting of the Avionics Panel, Paris, 15-19 Oct. 1979 (AGARD-CP-268; ISBN-92-835-0255-8) Avail: NTIS HC A24/MF A01

Simulation techniques and their applications to avionics and command, control, and communication systems associated with airborne operations are addressed. Modeling methodology, experimentation, validation, and applications are covered. Emphasis is on avionics and airborne command and control, including the range from large-scale force-effectiveness and air defense simulations through flight simulators and real time avionics simulations. For individual titles, see N80-19810 through N80-19847.

N80-19810# Syracuse Univ., N. Y. Dept. of Industrial Engineering and Operations Research.
AN INTRODUCTION TO THE SELECTION AND USE OF SIMULATION LANGUAGES c61
Robert G. Sargent *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 4 p refs (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

An introduction to the selection and use of simulation languages for digital computers is given. The topics discussed are the hierarchy of computer languages and their relationship to simulation, the advantages and disadvantages of using simulation languages, the factors to consider in selecting simulation languages for an organization and a language for solving a specific problem, some characteristics of the simulation languages GASP, GPSS, SIMSCRIPT, SIMULA, and SLAM, and future developments in simulation languages. The emphasis is on discrete and combined simulation languages. J.M.S.

N80-19811# Syracuse Univ., N. Y. Dept. of Industrial Engineering and Operations Research.
AN INTRODUCTION TO STATISTICAL ANALYSIS OF SIMULATION OUTPUT DATA c65
Robert G. Sargent *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 13 p refs Presented at the ACM 1976 Symp. on the Simulation of Computer Systems (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

Point and interval estimates (confidence intervals) of means for both terminal and steady state simulations are considered. The simple methods of replication, batch means, and regenerative cycles are presented in detail and applied to a model of a simple time shared computer system to illustrate their use. A brief discussion is included on sequential procedures and time series methods for obtaining these estimates. The advantages and

disadvantages of the various methods are given, including specific recommendations as to when certain methods might be used.
J.M.S.

N80-19812# Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (West Germany).
REMARKS ON SIMULATION. OBJECTIVES/AREAS OF USE/POSSIBILITIES/LIMITATIONS: AN OVERVIEW c09
Hans M. Franke *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 27 p refs (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

An overview of the extensive application of computerized simulation to the study of flight mechanics is presented with special interest given to avionics and command and control and communication. Areas of use of simulation covered include: the field of research; planning pre-design, assessment, and feasibility; the development phase; testing; and the training simulator. Systems analysis and systems engineering activities in the planning of new weapon systems are discussed in terms of the use of simulation.
J.M.S.

N80-19813# Department of the Air Force, Washington, D.C. Tactical Systems Div.
REPRESENTING HUMAN THOUGHT AND RESPONSE IN MILITARY CONFLICT SIMULATION MODELS c53
Dennis K. Leedom *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 15 p refs (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

Conflict simulation models and the representation of human thought and response in such models are considered. The ideas presented relate to the modeling of conflict situations from single combat unit level up through theater force level. In particular, the use of such models for assessing the utility of tactical command and control (C2) systems is emphasized.
J.M.S.

N80-19814# General Research Corp., Santa Barbara, Calif.
VERIFICATION AND VALIDATION OF AVIONIC SIMULATIONS c06
Sabina H. Saib *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 6 p (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

Avionic simulations require verification and validation so that the simulation results can be applied reliably to actual avionic systems. Software design methods as well as currently available automated aids for verification and validation are described. Reverification and revalidation of a simulation after changes are made is discussed. Simulations can be designed for ease of verification and validation. Guidelines to show how simulation software can be developed with verification in mind are presented.
R.E.S.

N80-19815# Forschungsinstitut fuer Funk und Mathematik, Werthoven (West Germany).
OBJECTIVES FOR BUILDING AN EXPERIMENTAL CCIS c32
Ingrid Hollinde *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 10 p refs (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

The problem of integrating the command and control information systems (CCIS) into the C(2) process is presented and feasible strategies to develop CCISs are discussed. An experimental CCIS, the EMFIS, was developed and was used in WINTEX/CIMEX 79 to clarify the preconditions for the use of ADP-support in the C(2) process. The performance of the EMFIS is described.
R.E.S.

N80-19816# Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (West Germany).
SIMULATION OF OVERALL AIR DEFENSE COMMAND AND CONTROL c32
Reinhard Hutter *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 15 p refs (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

A computer model that quantifies the effect of early warning and command and control in terms of active air defense measures of effectiveness was developed. The model is described along with the main technical and operational procedures which will be followed in air defense in case of an air attack. The model is rather aggregated, highly input oriented, independent of specific systems and doctrines and thus offers flexibility of application to various technical and operational questions. The development status of other models is discussed.
R.E.S.

N80-19817# Department of the Air Force, Washington, D.C. Tactical Systems Div.
THEATER AIR DEFENSE ENGAGEMENT SIMULATION-COMMAND/CONTROL/COMMUNICATIONS (TADENS-C(3)) AN APPROACH TO THEATER AIR DEFENSE MODEL/METHODOLOGY DEVELOPMENT c32
Urban H. D. Lynch *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 13 p (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

The theater air defense engagement simulation-command/control/communications (TADENS-C(3)) is a theater air defense model/methodology development whose goal is to timely produce a 'credible, agreeable, and usable' model/methodology to address tactical (strategic) theater air defense and its associated problems/issues. The model development scope is presented.
R.E.S.

N80-19818# Shape Technical Center, The Hague (Netherlands).
SIMULATION OF AIR DEFENCE OPERATIONS AND MULTIPLE AIR COMBAT c06
H. R. Wilhelm *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 20 p (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

The air defence system simulation model in use at the SHAPE Technical Centre is described. The model comprises detailed submodels for airborne and ground-based early warning sensors, command and control operations, ground-controlled intercepts, multiple air combat engagements, and electronic countermeasure operations. Modifications in hand will include the simulation of surface-to-air missile systems and will permit the interactive running of the model as a one-sided wargaming system with a battle manager commanding and controlling his air defence force via graphics displays. The computer configuration used in running the model is described and also the specific software methods employed. A three dimensional graphics facility was developed to facilitate the evolution and validation of tactics for modern fighter aircraft and future missiles. Additional validation methods were applied, such as the correlation of model results with live flying trails. A brief account of past and possible future applications is presented.
R.E.S.

N80-19819# NATO Programming Centre, Tongeren (Belgium).
SIMULATION WITHIN MILITARY DEFENCE SYSTEMS FOR TRAINING AND EVALUATION c06
Hans-Jochen Wunschmann *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 14 p (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

The use of simulated radar pictures to support war games within the NATO Air Defense Ground Environment system is discussed. Simulation hardware and software are described along with the different phases of war gaming.
K.L.

N80-19820# Institute of Aviation Medicine, Farnborough (England).
REAL-TIME SIMULATION: AN INDISPENSABLE BUT OVERUSED EVALUATION TECHIQUE c08
V. David Hopkin and A. J. McClumpha *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 6 p refs (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

Real time simulation is evaluated in relation to large man machine systems, particulary air traffic control systems. The limitations to using real time simulation to study computer

assistance, system capacity, workloads, stress, boredom, and attitudes are discussed. K.L.

N80-19821# Elektronik-System G.m.b.H., Munich (West Germany).
DESIGN AND SIMULATION OF A C3 SYSTEM FOR SURVEILLANCE PURPOSE c66
Franz Herzmann and Helmut Sanders *In* AGARD Modelling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 13 p refs (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

Communications, command, and control problems associated with the operation of a surveillance network and weapon systems are discussed. Tracing and allocation algorithms are designed and improved by simulating network operation. Weapon system operation, including coordination and target allocation, is also simulated. The system performance is tested using radar derived data. K.L.

N80-19822# Royal Signals and Radar Establishment, Malvern (England).
SIMBOX: A GENERAL PURPOSE DEFENSE SYSTEMS SIMULATOR c66
B. Davy *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 8 p (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

A simulation tool of sufficient flexibility to meet the simulation requirements of a variety of systems is presented. The design principles of SIMBOX are discussed and its use in assessing radar performance, tracking algorithms, and data handling systems is illustrated. K.L.

N80-19823# Mitre Corp., Bedford, Mass.
THE APPLICATION OF MODELING AND SIMULATION TO THE DEVELOPMENT OF THE E-3A c66
A. R. Shanahan *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 14 p (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

The role of modelling and simulation in developing an airborne radar, communications, and command-control system is discussed. The modelling diversity required during different stages of system development is emphasized. K.L.

N80-19824# Analytic Sciences Corp., Reading, Mass.
E-3A NAVIGATIONAL COMPUTER SYSTEM REAL-TIME ENVIRONMENTAL SIMULATOR c66
Richard D. Healy and Samuel Newman *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 8 p refs Prepared in cooperation with NADC, Warminster, Pa. (For primary document see N80-19809 10-59)
(Contract N62269-79-C-0020)
Avail: NTIS HC A24/MF A01

A software life-cycle support facility under development for the E-3A navigational computer system includes a real-time environmental simulator which is used to simulate both E-3A avionics and the operational environment so that software problems with the included AN/ARN-120 Omega Navigation Equipment (ONE) can be investigated and that the impact of software changes can be assessed by a simulated mission refly. The environmental simulator is a hybrid system hosted in two digital computers connected by a specially designed real-time digital data link. Real-time simulation software performs two distinct functions: provides computer-controlled analog and digital input data to the ONE and respond to ONE guidance outputs, and provides truth-model aircraft data which can be used as a precision navigation reference. Preliminary experience related to the design and construction of the environmental simulator for the software life-cycle support facility is presented, some of the practical problems encountered in developing the simulator are described, interim resolution and potential long-term solutions and current status are discussed. Particular emphasis is placed on describing procedures used for implementing the simulator development guidelines: maximum flexibility and minimum essential design. A.R.H.

N80-19825# Boeing Aerospace Co., Seattle, Wash.
A JTIDS PERFORMANCE MODEL FOR THE E-3A c66
James G. Taylor *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 13 p refs (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

The communications link performance model developed to predict performance of joint tactical information distribution system (JTIDS) links between the E-3A and other aircraft and ground stations is described. The JTIDS is a time division multiple access system operating in the radio frequency band 962 to 1213 MHz and employs spread spectrum techniques. The model includes the performance effects on the JTIDS wideband frequency hopping receiver due to both the E-3A dual antenna system and specular and diffuse multipath signals. Laboratory tests were conducted which provided receiver performance data for signals routed through dual antenna and multipath simulators. This simulator approach was also used in similar tests conducted by SHAPE Technical Centre for NATO. The results were essentially identical in the two test programs. A flight test program was conducted which validated the link performance model. This validated model has greatly reduced costly E-3A flight testing and has provided predictions of JTIDS performance over a variety of communication link scenarios and flight conditions. Author

N80-19826# Marconi Space and Defence Systems Ltd., Hillend (Scotland).
A MISSION TRAINING SIMULATOR FOR THE NIMROD MR MK 2 AND SOME ASPECTS OF THE DERIVATION AND VERIFICATION OF ITS SYSTEM MODELS c66
K. Wells *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 6 p (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

Three MK. 1 simulators are undergoing a major avionics refit to reflect the changes in the RAF's Nimrod MR Mk. 2. This refit necessitates the modification to Mk. 2 standard of the two prime sensor systems; acoustics and radar. In addition, the navigation and central tactical systems are being updated. The modifications both to the acoustics and to the radar are discussed. The definition of operations requirement and engineering implementation specifications for both hardware and software are described. The need to verify models to reflect the continuously changing design baseline as a result of aircraft development and user experience is discussed. A.R.H.

N80-19827# Mitre Corp., Bedford, Mass.
APPLICATION OF COMPUTER SIMULATIONS TO DEVELOPMENT OF NATO E-3A AUTOMATIC TRACK INITIATION ALGORITHMS c61
E. S. Alvarez and C. J. Sworobowicz *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 21 p (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

NATO E-3A airborne warning and control system will include the capability to initiate tracks automatically on targets of interest. Due to the complex and interacting nature of the automatic track initiation (ATI) process, development of a prototype ATI design must rely heavily on Monte Carlo computer simulations. Adaptable computer simulations were developed which provide the analyst with a versatile tool for evaluation of ATI design alternatives and performance sensitivities. Although the computer simulation was used for the E-3A ATI problem, it also has general application to the evaluation of overall tracking performance for the E-3A or for any track-while-scan system. The ATI design which evolved from this development effort utilizes a Kalman filter for track smoothing and prediction. A Kalman filter not only provides rapid and accurate determination of target position and velocity, but also provides estimates of tracking errors which can be used to advantage in the design of optimal adaptive correlation windows, maneuver detection thresholds, and track promotion/drop rules. Simulation results show that the ATI design provides excellent performance over a wide range of target conditions and target environments. A.R.H.

N80-19828# Defense Advanced Research Projects Agency, Arlington, Va.

AVIATION TRAINING USING VIDEO DISK TECHNOLOGY **c53**

Craig Fields and Steven Levin *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 2 p Prepared in cooperation with Interactive Television Co., Arlington, Va. (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

Video disks are a new technology that provide inexpensive storage (65 cent/disk) and rapid access (as little as 1/8 sec.) to large numbers (54,000 pictures/disk side) of photographs. For a typical airport, it is possible to store on a video disk compressed movies showing all runway, take-off, landing, circling, and approach paths. When such a disk is viewed on a player and television controlled by a simple microprocessor, the pilot can vicariously fly himself around an airport, land, take-off, taxi and circle. The pilot sees an image with photographic realism, can choose his own path and speed, and can choose time of day or weather conditions for the simulation trip. Such a system is one hundred times less expensive than a conventional flight simulator. Author

N80-19829# Societe Nationale Industrielle Aerospatiale, Marignane (France.) Div. Helicopteres.
DESIGN OF A SIMULATOR FOR STUDYING THE HELICOPTER - SDVEH [CONCEPTION D'UN SIMULATEUR DE VOL D'ETUDE POUR HELICOPTER - SOUEH] **c09**

Jl. Mascle, G. Catani, M. Sellier, and Jp. Letouzey *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 13 p In FRENCH (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

The conceptual stages in the design of a flight simulator (SDVEH), which will study the specific problems in the design and flight operations of military helicopters are reported. The principle characteristics of the flight simulator are delineated and points considered critical to the development of a helicopter program are discussed. The development and organization of the project are reported and a preliminary analysis of the exact needs of the SDVEH are presented. Transl. by A.W.H.

N80-19830# Institute for Defense Analyses, Arlington, Va.
COST-EFFECTIVENESS OF FLIGHT SIMULATORS FOR MILITARY TRAINING **c09**

Jesse Orlansky and Joseph String *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 13 p refs (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

The cost and effectiveness of flight simulators used for military training are evaluated. Recent cost data of modern flight simulators are analyzed. A comparison of the skills learned in flight simulators and the effectiveness with which they are performed in actual flight versus the skills learned in actual flight only is discussed. Results show that pilots trained in the simulators use less flight time to perform various tasks than do those trained only in aircraft. A.W.H.

N80-19831# Le Materiel Telephonique, Trappes (France).
USING A LANGUAGE DEVELOPED FOR AIRCRAFT SIMULATORS [UTILISATION D'UN LANGAGE EVOLUE POUR LES SIMULATEURS D'AVIONS] **c61**

Michel G. Dreyfus *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 7 p In FRENCH; ENGLISH summary (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

The advantages and disadvantages of flight simulator computers using assembler languages and simulation computers using FORTRAN are discussed. The impact of each method on the analytical and programming methods employed at each stage of program writing, debugging, and modification is reviewed. The consequences of computing power and memory capacity are also discussed. A.W.H.

N80-19832# Royal Aircraft Establishment, Farnborough (England).
SIMULATION OF A NIGHT VISION SYSTEM FOR LOW LEVEL HELICOPTER OPERATIONS **c06**

J. N. Barrett *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 24 p (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

The development of night vision piloting aids to enable helicopters to operate at low altitude by night is discussed. An experiment which explored the problems and possibilities of a helmet mounted display for such helicopter night piloting tasks, using real time simulation techniques is described. The development of the helicopter simulation, and how the various components of the proposed night vision system were modelled and incorporated into the simulation are reported. The experimental design for the trials and how the limitations of the simulation were taken into account are discussed. A.W.H.

N80-19833# Institute for Defense Analyses, Arlington, Va. Systems Evaluation Div.
USE OF SIMULATION IN THE EVALUATION OF THE IFFN PROCESS **c66**

J. E. Freedman and S. H. Starr *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 20 p ref (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

A program to evaluate the ability of the ISS to support the identification process in an operational environment is described. The role that modeling and simulation will play in the evaluation is emphasized. The types of tests that are to be employed to accomplish the program objectives are discussed. The primary test vehicle: a hybrid, geographically distributed testbed consisting of a central simulation facility, manned operational C-2 systems, and manned mission simulators, is described. The technical requirements for the testbed are summarized and the considerations underlying their formulation are examined. An example of a test design that considers the subphase of the program, where a programmed airborne early warning aircraft is employed in support of defensive counterair operations, is included. A.W.H.

N80-19834# Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (West Germany).
AIR-TO-AIR ENGAGEMENT SIMULATION **c66**

Goetz Wunderlich and Roland Braun *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 14 p (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

The development of an air to air engagement simulation multiduel model which considers the aircraft, its avionics, armament, and the pilots behavior is discussed. The model will also consider the phase prior to combat including the fighter allocation, combat air patrol, ground controlled intercept capability, influence of early warning systems, etc. Assumptions, problems, and applications of the model are discussed. A.W.H.

N80-19835# Mitre Corp., Bedford, Mass.
THE MITRE INTERACTIVE COMMUNICATIONS ANALYSIS PROGRAM (MICAP) **c66**

John M. Ruddy *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 22 p (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

The MITRE interactive communications analysis program (MICAP), a user oriented computer program, is described. The program provides complex communications system performance and cost analysis. The program output, a graphical presentation of the data, permits system synthesis and modification through rapid and easy system parameter iteration to obtain a desired system performance measure. The program structure and capabilities include cost/performance tradeoff analysis. Examples of modeling and prediction of satellite communication performance are presented. Applications to cost/performance tradeoffs and evaluation of architectural alternatives are discussed. A.W.H.

N80-19836# Societe Nationale Industrielle Aerospatiale, Toulouse (France).
NEW POSSIBILITIES OFFERED BY A RADIO-INERTIAL HYBRID GUIDANCE SYSTEM DIGITAL SIMULATION

STUDY [NOUVELLES POSSIBILITIES OFFERTES PAR UN SYSTEME DE GUIDAGE HYBRIDE RADIO - INERTIEL ETUDIE EN SIMULATION NUMERIQUE] c06

D. Buisson, J. Invoas, and J. Grossin *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 25 p In FRENCH ; ENGLISH summary refs (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

A radio inertial guidance system was studied to increase the accuracy of aircraft guidance along the ILS beams and to ensure continuation of automatic landing in the event of a localizer transmitter failure. Developments in the guidance system are discussed including the detection of the Loc beam centerline after an undetected failure in the monitoring of the Loc axis alignment with the runway axis. A digital simulation study which demonstrated the system performance is described. A.W.H.

N80-19837# British Aerospace Aircraft Group, Brough (England).
THE ROLE OF THE AIRCRAFT MODEL IN AVIONIC SYSTEMS SIMULATION c06

J. D. Bannister and R. Hicks *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 14 p refs (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

The relevance and use of the aircraft model in avionics systems simulation is discussed. The interaction between elements of the avionic systems, the vehicle dynamics and the outside world, and simulation is described. The aircraft model is discussed to indicate the choice to be made in determining the level of complexity required to fulfill differing objectives. Aircraft models of different types are described. Some algorithms and solution techniques are presented along with an indication of the limitations inherent in the models. Two contrasting simulations are discussed to show the significance of the aircraft model in relation to the avionic system simulation. The first example illustrates the use of an aircraft model in a GP computer simulation of the interception of invading aircraft. The second example discusses the aircraft model used in a pilot in the loop real time simulation of the avionics system for an attack aircraft. In both examples practical considerations are included such as processor requirements and simulation system architecture. A.W.H.

N80-19838# Battelle Columbus Labs., Ohio.
AVIONICS EVALUATION PROGRAM: SIMULATION MODELS FOR THE EFFECTIVENESS ANALYSIS OF AVIONICS c08

David Welp, Ken Almquist, and Larry Rainey *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 4 p Prepared in cooperation with AFAL, Wright-Patterson AFB, Ohio (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

The avionics evaluation program (AEP), a library of seven detailed avionics performance assessment models all driven by a common, interactive software package is examined. The AEP provides an efficient means for performing tradeoff analyses among cost, reliability, maintainability, and performance of avionic configurations. The models are the air to ground mission analysis program, target acquisition, weapon delivery, survivability, communications, air to air mission analysis, and dogfight analysis. Each model is described. A.W.H.

N80-19839# British Aerospace Dynamics Group, Bristol (England).
SIMULATION FOR WHOLE LIFE DEVELOPMENT c06

R. J. Morrow and R. Richards *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 11 p refs (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

A special prupose, real time simulator suitable for whole life development of complex avionics control systems is described. Software flexibility, a current equipment selling point, demands a reappraisal of previous equipment development procedures. Problems with high speed information handling will occur during the development of new digital controllers when used for command and control, ESM and EW system are discussed. The need to simulate those real world factors that load the information to the digital processing system under development. R.C.T.

N80-19840# Air Force Avionics Lab., Wright-Patterson AFB, Ohio.
A SIMULATION SUPPORT SYSTEM, THE DEVELOPMENT TOOL FOR AVIONIC SYSTEMS AND SUBSYSTEMS c06

John C. Ostgaard *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 11 p refs (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

The simulation support facility required for the development and validation of the digital avionics information system are discussed. The design requirements for an integrated simulation support system are given with emphasis on the following: avionic system support; prototype system software support; prototype system hardware support; engineering studies; maintenance augmentation; and training assistance. R.C.T.

N80-19841# Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (West Germany).
FIRE CONTROL FOR AIR-TO-AIR GUNNERY IN HIGH PERFORMANCE FIGHTER AIRCRAFT c06

Hans W. Pongratz *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 13 p (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

A survey on some of the aspects in air-to-air gunnery initiated by improvements in gun fire control are summarized. The simulation models used in the TKF simulation for gun fire control and gun scoring are presented. The necessary and the possible detail and accuracy of the implemented models is considered. R.C.T.

N80-19842# Electronique Marcel Dassault, St. Cloud (France).
SIMULATION FOR INTEGRATION WITH DYNAMIC TESTS OF THE LOGICAL ELEMENTS OF PRINCIPAL ONBOARD COMPUTERS [SIMULATEUR POUR INTEGRATION AVEC TESTS DYNAMIQUES DES LOGICIELS DE CALCULATEURS ENTRAUX EMBARQUES] c06

E. Bouthors *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 11 p In FRENCH (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

A system is described which was designed to simulate the environment of onboard computers and to furnish control methods which permit the adjustment and validation of logical elements before the effective integration of computers in real equipment environments. The essential characteristics of the system is to simulate the equipment environments, not at the level of their intrinsic operation, but at that of their interface with the computer in temporal, interactive, and information aspects. The simulation is made by the fusion of operator information with information registered on magnetic tape. This latter information simulates the different flight phases envisaged by tests while the operator information recreates in real-time, the action of the pilot and equipment. The possibilities of operating slowly and step-by-step confer a particular efficiency to the simulation and adjustment and validation of logical elements. Transl. by A.R.H.

N80-19843# Draper (Charles Stark) Lab., Inc., Cambridge, Mass. Guidance and Navigation Advanced Programs Div.
CRUISE-MISSILE-CARRIER NAVIGATION REQUIREMENTS c04

George T. Schmidt and Roy H. Setterlund *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 10 p refs (For primary document see N80-19809 10-59)
(Contract F33657-78-C-0473)
Avail: NTIS HC A24/MF A01

The modeling, simulation, and performance predictions used in determining aircraft avionics and transfer alignment requirements for a generic aircraft that would launch cruise missiles over water a considerable distance from a first TERCOM update area are discussed. The methodology used in allocating the allowable navigation errors between the CM guidance system and the cruise missile carrier aircraft avionics system is described. R.C.T.

N80-19844# National Aerospace Lab., Amsterdam (Netherlands).
A FLIGHT SIMULATION INVESTIGATION ON THE FEASI-

BILITY OF CURVED APPROACHES UNDER MLS GUIDANCE c66

L. J. J. Erkelens *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 18 p refs (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

A simulation investigation concerning the possibilities of executing laterally curved approaches with a wide body type of aircraft in a microwave landing system environment is described. The approach path variables were: final approach intercept altitude and angle of the turn. An Earth fixed circular segment connected the straight preturn segment with the final segment. A flight director operating in the instrument landing system tracking mode, supplied with minor modifications in the roll bar drive, is used as the primary instrument for guidance. Additional provisions are made to enable the pilot to monitor the approach. A total number of about 450 curved approaches, performed by three pilots, are flown on the simulator under various weather conditions. In addition to tracking data, subjective information like pilot ratings and comments are gathered. Curved approaches, with turn angles up to 180 deg can be carried out safely, provided that the altitude at which the turn is completed is not less than 305 m (1000 ft). Special provisions are needed with respect to the flight director roll bar drive, in order to achieve accurate tracking on the curved segment in strong wind conditions. M.G.

N80-19845# Boston Univ., Mass.

MODELING AND FLIGHT SIMULATION OF AN ACTIVE CONFIGURED AIRCRAFT UNDER M.L.S. GUIDANCE c66

A. Danesi, S. Smolka, and U. Chinappi *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 16 p Prepared in cooperation with Rome Univ., Italy (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

A mathematical formulation is presented to integrate the differential equations modeling a vehicle automatically guided along a curvilinear trajectory by a microwave landing system (M.L.S.). The augmented linear state equation, representing the open loop vehicle M.L.S. observer system, is given in standard phase variable form in which the altitude perturbations from the reference trajectory and numbers of its successive derivatives are assumed as state variables involved in a multifeedback flight control system. The state equation taken into consideration in system modeling handles separately the transfer function characteristics polynomial while the dynamical effects of the system zeros are included in the algebraic output equation relating the actual attitude perturbations to the state variables defined, in a rather fictitious fashion, in a state equation. The initial conditions to be imposed in the integration process must be consistent with the physical initial conditions on the actual trajectory considered in the problem at hand and for that purpose mathematical solution to the problem of transforming the initial conditions imposed on the physical state variables to the correspondent fictitious ones, is advanced. M.G.

N80-19846# Naval Air Development Center, Warminster, Pa.

MODELING THE HUMAN OPERATOR: APPLICATIONS TO SYSTEM COST EFFECTIVENESS c66

Norman E. Lane, Melvin I. Strieb (Analytics, Inc., Willow Grove, Pa.), and Walter Leyland *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 13 p refs (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

A technique for predicting system effectiveness which includes a consideration of realistic operator/system interactions is described. Operator interface cost effectiveness analysis (OICEA) combines system modeling with cost projections to evaluate the cost benefits of alternative proposed designs within appropriate mission contexts. Major avionics variables are integrated into a cohesive approach which simulates hardware and software functions and the performance of an operator interacting with these components, using a model called the human operator simulator. OICEA allows for systematic variation of key factors that influence flectiveness, including degree and type of task automation, equipment and human reliability, scenarios and tactical doctrine, and operator characteristics. The OICEA methodology is summarized and applications to avionics and sensor improvements on a fixed wing antisubmarine warfare platform are documented. M.G.

N80-19847# Naval Air Development Center, Warminster, Pa.

PREDICTING FIELD OF VIEW REQUIREMENTS FOR VSTOL AIRCRAFT APPROACH AND LANDING c66

Paul M. Linton and Warren F. Clement *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 17 p refs Prepared in cooperation with Systems Technology, Inc., Mountain View, Calif. (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

A rationale for quantitatively determining fixed-wing, vertical/short take-off and landing aircraft field of view requirements is developed. The interactions between human visual processes, the vehicle approach profile, and the operator flight path control performance are considered. A model specifies precise visual requirements for recovery aboard defined shipboard pads or forward sites. M.G.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

N80-19848# Naval Postgraduate School, Monterey, Calif.

SECURITY KERNEL DESIGN FOR A MICRO-PROCESSOR-BASED, MULTILEVEL ARCHIVAL STORAGE SYSTEM M.S. Thesis

Aaron Ray Coleman Dec. 1979 109 p refs
(AD-A078281) Avail: NTIS HC A06/MF A01 CSCL 09/2

This thesis is a detailed design of a security kernel for an archival file storage system. Microprocessor technology is used to address a major part of the problem of information security in a distributed computer system. Utilizing multiprogramming techniques for processor efficiency, segmentation for controlled sharing, and a loop-free structures for avoiding intermodule dependencies, the Archival Storage is designed for implementation on the Zilog Z8001 microprocessor with a memory management unit. The concepts of a process structure and a distributed kernel are used in providing management of the shared hardware resources of the system. The security kernel primitives create a virtual machine environment and provide information security in accordance with a non-discretionary security policy. GRA

N80-19849# Texas Instruments, Inc., Dallas. Central Research Labs.

BINARY/ANALOG CCD CORRELATOR DEVELOPMENT Interim Report, 1 Aug. 1978 - 31 Jan. 1979

R. A. Haken and R. C. Pettengill Sep. 1979 49 p
(Contract F19628-78-C-0122; AF Proj. 4600)
(AD-A077572; TI-08-79-10; RADC-TR-79-21123) Avail: NTIS HC A03/MF A01 CSCL 09/5

This report describes the design of a general-purpose, electronically programmable, 1024-bit binary/analog CCD correlator. The key features of the filter are: programmability of the reference signal, correlator length and weighting coefficient accuracy. This results in a filter with the flexibility to be operated in nine programmable configurations. Minimization of off-chip circuitry by including all analog and digital shift registers, clock drivers, logic, and output amplifiers on-chip. GRA

N80-19850# Maryland Univ., College Park. Dept. of Computer Science.

THE STRUCTURE OF SPECIFICATIONS AND IMPLEMENTATIONS OF DATA ABSTRACTION

Mark A. Ardis and Richard G. Hamlet Sep. 1979 53 p refs
(Grant AF-AFOSR-3181-77; AF Proj. 2304)
(AD-A077427; AFOSR-79-1154TR; TR-801) Avail: NTIS HC A04/MF A01 CSCL 05/2

A data abstraction is a collection of sets together with a collection of functions. An intuitive abstraction is unconnected with formalism: the sets and functions are supposed to be known

ab initio. Formal ideas enter when the abstraction is (1) implemented, a conventional program written to carry out the operations on actual data; and (2) specified, a mathematical characterization given to precisely describe its sets and functions. The intuitive abstraction, an implementation, and a specification share a syntax that names the sets and functions, and gives the function domains and ranges (as set names). The central question for any particular example of syntax is whether the semantics of the three ideas correspond: does the collection of objects and operations a human being was thinking of behave in the way the implementation's data and procedures behave? Do the mathematical entities behave as imagined? The questions can never be answered precisely, because the intuitive abstraction is imprecise. On the other hand precise comparison of specification and implementation is possible. This paper presents an algebraic comparison of specifications with implementations. It is shown that these abstractions always overlap, and have a common (lattice) structure that is valuable in understanding the modification of code or specification. GRA

N80-19851# Honeywell, Inc., St. Petersburg, Fla.
MILITARY ADAPTATION OF COMMERCIAL ITEM (MACI) PROGRAM ON ELECTRICALLY ALTERABLE READ ONLY MEMORY (EAROM) Interim Report, 15 Jul. 1978 - 15 Jan. 1979
Richard L. Wiker Oct. 1979 281 p refs
(Contract DAAB07-78-C-2935)
(AD-A078594; HONEYWELL-1079-16060; DELET-TR-78-2935-1; IR-1) Avail: NTIS HC A13/MF A01 CSCL 09/2

A military applications survey for EAROM devices was conducted. Three potential vendors of suitable EAROM devices were identified at GI, NCR and Nitron. Devices were procured and testing started. Measurement techniques were developed to characterize unique MNOS parameters. GRA

N80-19852# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.
DESIGN AND ANALYSIS OF INTERCONNECTION NETWORKS FOR PARTITIONABLE PARALLEL PROCESSING SYSTEMS Interim Report
S. Diane Smith and Howard Jay Siegel Aug. 1979 297 p refs
(Grant AF-AFOSR-3581-78; AF Proj. 2304)
(AD-A078690; TR-EE-79-39; AFOSR-79-1272TR) Avail: NTIS HC A13/MF A01 CSCL 09/2

A single instruction stream - multiple data stream (SIMD) computer performs one algorithm (single instruction stream) on vectors of data of a control unit (CU), processing elements (PEs), and an interconnection network. The CU broadcasts instructions to the N Pes (where N is a power of two). The interconnection network is the mechanism that allows PEs to pass data among themselves. Four types of interconnection networks are discussed in this work: the Shuffle-Exchange network, the Cube network, the ILLIAC network, and the Plus-Minus 2 (PM2I) network. Each type has been discussed in the literature and used in an existing or proposed machine design. For each of these four network types, different hardware structures are considered. A recirculating network consists of one stage of switches that is reused until the data reach their final destinations. A combinational logic multistage network consists of several stages of switches and, usually, data is transferred in one pass through the network. In pipelined multistage networks, which are introduced, registers are inserted after each stage of a combinational logic multistage network. The data are divided into segments, and these segments are passed in a parallel-pipelined manner. Hardware implementations for recirculating, combinational logic multistage, and pipelined multistage networks are presented and analyzed. GRA

N80-19853# California Univ., Los Angeles. Graduate School of Management.
ON THE USE OF SIMULATION IN THE DESIGN AND IMPLEMENTATION OF DISTRIBUTED SYSTEMS
Bennet P. Lientz Dec. 1979 21 p refs
(Contract N00014-75-C-0266; NR Proj. 049-345)
(AD-A078322) Avail: NTIS HC A02/MF A01 CSCL 09/2

The need for planning and design of distributed systems has been stressed repeatedly. However, insufficient attention has been directed at the organized employment of mathematical and statistical tools which are computer based. Developed here is a general methodology for planning distributed systems using simulation as the major ingredient. Applications of the methodology are discussed. GRA

N80-19854# Los Alamos Scientific Lab., N. Mex.
COMPUTER APPLICATIONS Annual Report, 1 Oct. 1977 - 30 Sep. 1978
William Mort Saunders, Calvin L. Campbell (Dept. of Agriculture, Albuquerque, N. Mex.), Jean V. Lester (Dept. of Agriculture, Austin, Tex.), and Robert J. Payne Sep. 1979 28 p refs
(Contract W-7405-eng-36)
(LA-7844-PR) Avail: NTIS HC A03/MF A01

The application of computer technology to surveillance of slaughterplants in Texas. A pilot study of the New Mexico brucellosis eradication program; and the market cattle identification program in Texas is discussed. DOE

N80-19855# Boeing Computer Services, Inc., Seattle, Wash. Energy Technology Applications Div.
DISTRIBUTION DATA BASE DESIGN Final Report
D. J. Inglis Aug. 1979 59 p Sponsored by Elec. Power Res. Inst. 3 Vol.
(EPRI Proj. 1139-1)
(EPRI-EL-1150-Vol-1) Avail: NTIS HC A04/MF A01

An integrated distribution data base was designed and guidelines for economic evaluation and implementation of the design formulated. The conceptual design has a network structure which reflects the multiple-association relationship of the data. Implementation of the data base on a pilot basis is recommended. DOE

N80-19856# Boeing Computer Services, Inc., Seattle, Wash. Energy Technology Applications Div.
DISTRIBUTION DATA BASE DESIGN Final Report
D. J. Inglis Aug. 1979 308 p refs Sponsored by Elec. Power Res. Inst. 3 Vol.
(EPRI Proj. 1139-1)
(EPRI-EL-1150-Vol-2) Avail: NTIS HC A14/MF A01

The functional capabilities of the distribution data base are described along with economic evaluation of the system. DOE

N80-19857# Boeing Computer Services, Inc., Seattle, Wash. Energy Technology Applications Div.
DISTRIBUTION DATA BASE DESIGN Final Report
D. J. Inglis Aug. 1979 122 p refs Sponsored by Elec. Power Res. Inst. 3 Vol.
(EPRI Proj. 1139-1)
(EPRI-EL-1150-Vol-3) Avail: NTIS HC A06/MF A01

The practical implications of the distribution data base are presented. The data base logical design, physical implementation considerations, and digital mapping, are considered along with support system requirements and factors which effect implementation schedules. J.M.S.

N80-19858# National Technical Information Service, Springfield, Va.
RANDOM ACCESS MEMORIES. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Nov. 1979
Brian Carrigan Dec. 1979 216 p Supersedes NTIS/PS-78/1221; NTIS/PS-77/1100; NTIS/PS-76/0997; NTIS/PS-75/811
(PB80-802333; NTIS/PS-78/1221; NTIS/PS-77/1100; NTIS/PS-76/0997; NTIS/PS-75/811) Avail: NTIS HC $30.00/MF $30.00 CSCL 09B

The bibliography cites Government-sponsored research reports on the design, development, and application of random access storage devices and materials. Studies are included on wall placement techniques, domain wall observation, microcircuitry, and software development. This updated bibliography contains 188 abstracts, 18 of which are new entries to the previous edition. GRA

N80-19859# National Technical Information Service, Springfield, Va.
RANDOM ACCESS MEMORIES, VOLUME 1. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress

Report, 1974 - 1977
Brian Carrigan Dec. 1979 249 p
(PB80-802341) Avail: NTIS HC $30.00/MF $30.00 CSCL 09B

Research on the design, development, and application of random access computer storage devices is cited in this bibliography of worldwide journal literature. Research on charge coupled devices in random access storage, random access memories in microprocessor applications, and reliability of random access memories are included. This updated bibliography contains 237 abstracts, none of which are new entries to the previous edition. GRA

N80-19880# National Technical Information Service, Springfield, Va.
RANDOM ACCESS MEMORIES. VOLUME 2. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1978 - Nov. 1979
Brian Carrigan Dec. 1979 167 p Supersedes NTIS/PS-78/1222; NTIS/PS-77/1111; NTIS/PS-76/0998
(PB80-802358; NTIS/PS-78/1222; NTIS/PS-77/1111; NTIS/PS-76/0998) Avail: NTIS HC $30.00/MF $30.00 CSCL 09B

Research on the design, development, and application of random access computer storage devices is cited in this bibliography of worldwide journal literture. Research on charge coupled devices in random access storage, random access memories in microprocessor applications, and reliability of random access memories are included. This updated bibliography contains 161 abstracts, 18 of which are new entries to the previous edition. GRA

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N80-19861*# Intermetrics, Inc., Huntsville, Ala.
NSSC-2 OPERATING SYSTEM DESIGN REQUIREMENTS SPECIFICATION Final Report
T. T. Schansman and J. R. Bounds 15 Aug. 1979 78 p refs
(Contract NAS8-33382)
(NASA-CR-161396; IR-432) Avail: NTIS HC A05/MF A01 CSCL 09B

The design requirements and implementation standards for an NSSC-2 operating system are defined. An operating system diagram is presented along with system concepts and terminology. K.L.

N80-19862*# Research Triangle Inst., Research Triangle Park, N. C.
DEVELOPMENT AND USAGE OF A FALSE COLOR DISPLAY TECHNIQUE FOR PRESENTING SEASAT-A SCATTEROMETER DATA
Clayton B. Jackson Jan. 1980 66 p refs Original contains color illustrations
(Contract NAS1-15338)
(NASA-CR-159203) Avail: NTIS HC A04/MF A01 CSCL 09B

A computer generated false color program which creates digital multicolor graphics to display geophysical surface parameters measured by the Seasat-A satellite scatterometer (SASS) is described. The data is incrementally scaled over the range of acceptable values and each increment and its data points are assigned a color. The advantage of the false color display is that it visually infers cool or weak data versus hot or intense data by using the rainbow of colors. For example, with wind speeds, levels of yellow and red could be used to imply high winds while green and blue could imply calmer air. The SASS data is sorted into geographic regions and the final false color images are projected onto various world maps with superimposed land/water boundaries. K.L.

N80-19863*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ALGORITHM FOR CALCULATING TURBINE COOLING FLOW AND THE RESULTING DECREASE IN TURBINE EFFICIENCY
James W. Gauntner Feb. 1980 23 p refs
(NASA-TM-81453; E-384) Avail: NTIS HC A02/MF A01 CSCL 09B

An algorithm is presented for calculating both the quantity of compressor bleed flow required to cool the turbine and the decrease in turbine efficiency caused by the injection of cooling air into the gas stream. The algorithm, which is intended for an axial flow, air routine in a properly written thermodynamic cycle code. Ten different cooling configurations are available for each row of cooled airfoils in the turbine. Results from the algorithm are substantiated by comparison with flows predicted by major engine manufacturers for given bulk metal temperatures and given cooling configurations. A list of definitions for the terms in the subroutine is presented. K.L.

N80-19864# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
DEPENDENCY DIRECTED REASONING FOR COMPLEX PROGRAM UNDERSTANDING
Howard Elliot Shrobe Apr. 1979 303 p refs
(Contract N00014-75-C-0643)
(AD-A078055; AI-TR-503) Avail: NTIS HC A14/MF A01 CSCL 06/4

Artificial Intelligence research involves the creation of extremely complex programs which must possess the capability to introspect, learn, and improve their expertise. Any truly intelligent program must be able to create procedures and to modify them as it gathers information from its experience. A crucial stepping stone in AI research is the development of a system which can understand complex programs well enough to modify them. The Programmer's Apprentice Project is attempting to develop an interactive programming tool which will help expert programmers deal with the complexity involved in engineering a large software system. This report describes REASON, the deductive component of the programmer's apprentice. REASON is intended to help expert programmers in the process of evolutionary program design. REASON utilizes the engineering techniques of modelling, decomposition, and analysis by inspection to determine how modules interact to achieve the desired overall behavior of a program. REASON coordinates its various sources of knowledge by using a dependency-directed structure which records the justification for each deduction it makes. Once a program has been analyzed, these justifications can be summarized into a teleological structure called a plan which helps the system understand the impact of a proposed program modification. GRA

N80-19865# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
COMPUTER AIDED EVOLUTIONARY DESIGN FOR DIGITAL INTEGRATED SYSTEMS
Gerald Jay Sussman, Jack Holloway, and Thomas F. Knight, Jr. May 1979 26 p refs
(Contract N00014-75-C-0643; Grant AF-AFOSR-3993-78; Grant NSF MCS 77-04828)
(AD-A078124; AI-M-526) Avail: NTIS HC A03/MF A01 CSCL 09/2

We propose to develop a computer aided design tool which can help an engineer deal with system evolution from the initial phases of design right through the testing and maintenance phases. We imagine a design system which can function as a junior assistant. It provides a total conversational and graphical environment. It remembers the reasons for design choices and can retrieve and do simple deductions with them. Such a system can provide a designer with information relevant to a proposed modification and can help him understand the consequences of simple modifications by pointing out the structures and functions which will be affected by the modifications. The designer's assistant will maintain a vast amount of such annotation on the structure and function of the system being evolved and will be able to retrieve the appropriate annotation and remind the designer about the features which he installed too long ago to remember, or which were installed by other designers who work with him. We will develop the fundamental principles behind such a

designer's assistant and we will construct a prototype system which meets many of these desiderata. GRA

N80-19868# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.

COMPUTER AIDED EVOLUTIONARY DESIGN FOR SOFTWARE ENGINEERING

Charles Rich, Howard E. Shrobe, and Richard C. Waters Jan. 1979 23 p refs

(Contracts N00014-75-C-0643; N00014-75-C-0661)

(AD-A078060; AI-M-506) Avail: NTIS HC A02/MF A01 CSCL 09/2

This memorandum reports on a partially implemented interactive computer aided-design tool for software engineering. A distinguishing characteristic of this project is its concern for the evolutionary character of software systems. It draws a distinction between algorithms and systems, centering its attention on support for the system designer. Although verification has played a large role in recent research, this perspective suggests that the complexity and evolutionary nature of software systems require a number of additional techniques. Managing of complexity is a fundamental issue in all engineering disciplines. The authors identify three major techniques used in mature engineering fields which seem applicable to the engineering of software systems: incremental modelling; multiple and almost hierachical decomposition; and analysis by inspection. Along these lines they have (1) constructed a plan library to aid in analysis by inspection (the analysis of a program based on identifying standard algorithms and methods in it); (2) identified a small set of plan building methods which can be used to decompose a software system into loosely coupled subsystems; (3) developed the technique of temporal abstraction which makes it possible to model a program from a viewpoint which clearly separates the actions of generations and consumers of data; and (4) developed a dependency-based reasoning system uniquely suited to incremental and evolutionary program analysis. These methods are substantially language independent and have been applied to programs written in several commonly used languages. GRA

N80-19867# University of Southern California, Marina del Rey. Information Sciences Inst.

A FORMAL DEFINITION OF AMDL

Peter W. Alfvin Oct. 1979 79 p refs

(Contracts F30602-78-C-0008; DAHC15-72-C-0305)

(AD-A078035; ISI/RR-79-78) Avail: NTIS HC A05/MF A01 CSCL 09/2

Since the introduction of ISP, the use of hardware description languages (HDLs) has increased dramatically. Used originally to describe at the programming level the instruction sets of digital computers, hardware descriptions are now being used in applications such as design automation, emulation, compiler generation, and program verification - to name only a few. This surge of activity has put the existing HDLs to the thorough test, with each application area making its own set of demands on the languages. One common demand, however, is for a precise definition of the HDLs themselves. AMDL is an abstract form of the hardware description language ISPS. This report presents a formal definition of AMDL, using the techniques of denotational semantics as developed by Scott and Strachey. AMDL includes some nonstandard control and data structures which are easily handled by this definitional method. This report assumes familiarity with descriptive denotational semantics. GRA

N80-19868# Naval Research Lab., Washington, D. C. Communications Sciences Div.

SOFTWARE ENGINEERING PRINCIPLES

Louis Chmura and David Weiss Jun. 1979 610 p refs Sponsored in part by Naval Postgraduate School, Monterey, Calif.

(XF21241021)

(AD-A078005) Avail: NTIS HC A99/MF A01 CSCL 09/2

Since 1973, the Information Systems Staff at the Naval Research Laboratory (NRL) has studied many of the managerial and technical problems connected with Navy software acquisition, development, and maintenance. One observation has been that persons responsible for software could benefit greatly from training in state-of-the-art software engineering technology. Another has been that a better job of software design is essential if software is to meet requirements and be maintained inexpensively. These two observations have led to the course 'Software Engineering Principles', which addresses some important technical problems concerning software design. First taught in 1976 by NRL, the course is now presented annually by NRL together with the Naval Postgraduate School (NPS). 'Software Engineering Principles,' introduces some important design principles that encourage production of correct, understandable, and easily changed software products. Also examined are some software engineering research that may result in valuable design principles in the near future. The course will not turn one into an expert designer, but should improve one's ability to evaluate software proposals, progress, and products. It should also generate a better appreciation of design approaches, design problems, and ongoing research. GRA

N80-19869# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.

METRICS OF SOFTWARE QUALITY Annual Report, 1 Jun. 1978 - 31 May 1979

Z. Jelinski and P. B. Moranda Aug. 1979 28 p refs

(Contract F49620-77-C-0099; AF Proj. 2304)

(AD-A077896; AFOSR-79-0976TR) Avail: NTIS HC A03/MF A01 CSCL 09/2

This report covers the period from 1 June 1978, to 31 May 1979, during which the second of three phases was completed. This phase concentrated on the augmentation of the Program Testing Translator described in the Final Report on AFOSR F44620-74-C-008 of December 1976. The augmentation permits formation of links of greater length than those previously used. It also alleviates the process of composing the tracks of execution sequences, a requirement for establishing an automatic record of the status of testing. Applications have been made to an Air Force logistics model (Optimum Repair Level Analysis-ORLA). In these applications tests were made with the purpose of successively increasing the count of exercised tracks. Because there are numerous user-selected options the count so obtained was not truly indicative of the data base's effect on testing. Nonetheless progress has been made in determining the way to process programs automatically in the way indicated in the Annual Report for the preceding period. GRA

N80-19870# Lockheed Missiles and Space Co., Palo Alto, Calif.

GLOBALMIN: A COMPUTER PROGRAM FOR GLOBAL OPTIMIZATION Interim Report, Jul. 1976 - 15 Sep. 1979

Eldon R. Hansen 15 Nov. 1979 125 p

(Contract F49620-76-C-0003; AF Proj. 2304)

(AD-A078089; LMSC-D683307; AFOSR-79-1227TR) Avail: NTIS HC A06/MF A01 CSCL 12/1

GLOBALMIN is a program for finding the global minimum of nonlinear function f C sq of n variables. It provides infallible bounds on the minimum value F^* of f in any prescribed box (a box is a parallelopiped with sides parallel to the coordinate axes). It also provides infallible bounds on the point(s) x^* at which the global minimum occurs. The implementation of an algorithm that provides infallible bounds on the global minimum of any twice continuously differentiable real function of n real variables on a closed, bounded domain is described. The algorithm also provides infallible bounds on the location of the global minimum. The algorithm uses interval arithmetic and requires the availability of several fundamental interval arithmetic processors for its operation. GRA

N80-19871# Naval Surface Weapons Center, Dahlgren, Va.

SOLUTION OF THE INTEGER CONCAVE PROGRAM USING THE ICON ALGORITHM, VOLUME 1 Final Report

Harlan W. Loomis Nov. 1979 130 p refs

(AD-A077842; NSWC/TR-3119) Avail: NTIS HC A07/MF A01 CSCL 12/2

The branch-and-bound technique has been the basis for algorithms to solve both the mixed integer linear program (having linear objective function, linear constraints, and integrality restrictions on some variables) and the concave nonlinear program (having a separable concave objective function and linear constraints). The subprograms for each of these branch-and-bound algorithms are linear programs with simple upper bounds. GRA

N80-19872# Maryland Univ., College Park. Computer Vision Lab.

LOG DIAMETER RESTRICTED BOTTOM-UP TRIANGLE CELLULAR ACCEPTORS UTCA'S
Reinhard Klette Sep. 1979 16 p refs
(Grant AF-AFOSR-3271-77)
(AD-A077526; TR-809; AFOSR-79-1160TR) Avail: NTIS HC A02/MF A01 CSCL 09/4

The languages accepted by UTCA's in log diameter time are the same as those accepted by UTCA's in which a cell's new state depends only on its sons' states and not on its own preceding state. This set of languages remains the same if we allow log diameter plus constant time, but it increases if we allow 2 log diameter time. It is also shown that this set is the same as the set of languages generated by a special class of 'power of 2' OL-systems. GRA

N80-19873# California Univ., Davis. Signal and Image Processing Lab.
INTERFRAME ADAPTIVE DATA COMPRESSION TECHNIQUES FOR IMAGES
Jaswant R. Jain and Anil K. Jain Aug. 1979 195 p refs
(Grant DAAG29-78-G-0206)
(AD-A078841; ARO-16222.2-EL) Avail: NTIS HC A09/MF A01 CSCL 09/4

A method of interframe motion measurement and compensation, based on approximation of piecewise linear translation of small rectangular areas, is presented. This method significantly improves the temporal correlation and permits reduction of sampling rate along temporal axis. A technique of visual characterization of interframe characteristics, based on temporal cross-sections, is described. Some commonly used statistical models for prediction of the variances of transform coefficients, in intraframe and interframe transform coding, are compared. Results show that measured statistics in transform domain result in 2 to 4 dB improvement over commonly used separable covariance models. Interframe transform and hybrid coding schemes are compared against intraframe transform coding and some simple interframe predictive coding schemes. Also, distortion-rate curves for hybrid coding, based on models of interframe motion have been plotted. The applications of transform and hybrid coding to biomedical X-ray images has been considered. A method for joint optimization of source coding and channel coding for PCM transmission over noisy channels is presented. The performance of several transforms has been compared for some commonly used intraframe nonseparable covariance models. GRA

N80-19874# Boston Coll., Chestnut Hill, Mass. Space Data Analysis Lab.
NUMERICAL AND DATA ANALYSIS TECHNIQUES APPLIED TO SCIENTIFIC RESEARCH, 3 Final Report, 1 Jan. 1976 - 31 Dec. 1978
Neil J. Grossbard, Joseph Martine, Edward N. Richards, Theodore Persakis, and Robert Boudreau 31 May 1979 74 p refs
(Contract F19628-76-C-0147)
(AD-A075383; BC-SDAL-79-1; AFGL-TR-79-0132) Avail: NTIS HC A04/MF A01 CSCL 09/2

This report describes the mathematical and numerical analysis techniques used in the solution of three of the major problem efforts engaged in under Air Force Contract F19628-76-C-0147. Although many other problems were solved under this contract, the analysis and techniques utilized were for the most part similar with variations to those described in the two previous reports. GRA

N80-19875# General Research Corp., Santa Barbara, Calif. Systems Technology Group.
USING ASSERTIONS FOR ADAPTIVE TESTING OF SOFTWARE Interim Report
Dorothy M. Andrews Sep. 1979 15 p refs
(Contract F49620-79-C-0115; AF Proj. 2304)
(AD-A077398; GRC-TM-2270; AFOSR-79-1142TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

One way of assuring greater reliability of software is to improve testing techniques. Three of the key problems associated with software testing are: choosing adequate test cases, assuring correctness of results, and reducing the high cost of testing. By combining the capability of adaptive testing with use of executable assertions, it is possible to execute a program automatically with a large number of test cases over a wide range of input values. The usual goal of adaptive testing is to maximize some performance value (objective function) for the software by automated perturbation of the input parameters in such a way as to degrade the system performance to a specified limit but this technique only indirectly leads to locating errors. In software testing, the primary goal is to locate the maximum number of errors. Since software errors can be detected by executable assertions, these assertions can be used to define an objective function for the adaptive tester so that a program can be tested automatically and a mapping made of its 'error space'. A search algorithm is used to generate new test cases based on past performance data about the number of assertion violations. Software testing can become much more efficient and effective through use of adaptive testing with assertions because such extensive testing increases the possibility of finding any existing errors and of improving software reliability. GRA

N80-19876# Ohio State Univ. Research Foundation, Columbus.
METHODOLOGIES FOR COMPUTER PROGRAM TESTING Final Report, 1 Jul. 1977 - 30 Jun. 1979
B. Chandrasekaran and Lee J. White 10 Aug. 1979 131 p refs
(Grant AF-AFOSR-3416-77; AF Proj. 2304)
(AD-A077414; OSURF/760722/784741; AFOSR-79-1095TR) Avail: NTIS HC A07/MF A01 CSCL 09/2

This report summarizes research, on computer program testing, in particular the development of a strategy called the Domain Testing Strategy. For a large and important class of programs, this strategy enables the generation of test data which can test, in principle, for all errors in the control flow of a program. Among the constraints for practical application of the strategy is that the predicates that affect the control flow are linear in the input variables. The extension of the strategy to modular testing of programs is presented. The sensitivity of the strategy to changes in certain parameters is discussed and implementation of a pilot system to generate test data using this strategy is outlined. GRA

N80-19877# Maryland Univ., College Park. Computer Science Center.
CELLULAR D-GRAPH AUTOMATA WITH AUGMENTED MEMORY Interim Report
Tsvi Duritzki and Angela Wu Jun. 1979 20 p refs
(Grant AF-AFOSR-3271-77)
(AD-A077389; TR-771; AFOSR-79-1164TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

This paper deals with cellular d-graph automata in which each node has internal memory proportional to log sub d-1 of N where N is the number of nodes in the underlying graph G. It is shown how such an automation can assign unique labels to the nodes of G in Ollog sub d-1 of N) time. Such an automation can also count the number of nodes and edges in G in Ollog sub d-1 of N) time. Algorithms for identifying all the cut nodes and all bridges in G, each in Ollog sub d-1 of N) time, are also presented. GRA

N80-19878# Army Armament Research and Development Command, Dover, N. J. Management Information Systems Directorate.
BAYESIAN INTERACTIVE GRAPHICS RELIABILITY ASSESSMENT PROCEDURE (BIGRAP)
Irving E. Teviovitz and John G. Mardo 1978 74 p refs
(AD-A077641; MISD-UM-78-9) Avail: NTIS HC A04/MF A01 CSCL 09/2

BIGRAP is a package of interactive graphics programs, written for use on the TEKTRONIX 4014 Graphics Terminal connected to the ARRADCOM CDC 6500/6600 computer configuration. This package consists of a set of intricate programs that allows a user to input component success/failure data and a Boolean expression depicting system reliability logic for the purpose of assessing system reliability. The computer converts the logic expression to an algebraic expression for the system reliability as a function of the individual component reliabilities. A Bayesian statistical algorithm is then employed to provide the user with point and confidence interval estimates of system reliability. In addition the graphics feature of the package displays histograms and corresponding Beta distributions involved in the

analysis. The programs are run sequentially as a cataloged procedure using the BEGIN/REVERT utility. This report is intended to serve as a guide to potential users of BIGRAP for operation and interpretation of results. GRA

N80-19879# University of Southern California, Los Angeles. Dept. of Computer Science.
JOYCE: A LANGUAGE FOR COMPUTER NETWORKS
Per BrinchHansen Nov. 1979 43 p refs
(Contract N00014-77-C-0714; NR Proj. 048-647)
(AD-A078706) Avail: NTIS HC A03/MF A01 CSCL 09/2

This report defines an experimental programming language called JOYCE which is intended for real-time applications controlled by microcomputer networks without common storage. The language includes distributed processes which communicate and synchronize themselves by means of procedure calls and guarded regions. The present version of the language is implemented on a PDP 11 single-processor system. The compiler is not available for distribution. GRA

N80-19880# Stevens Inst. of Tech., Hoboken, N. J.
FORTRAN PROGRAM OBLIQUE IN PL-FORMAT USER'S MANUAL
Daniel T. Valentine Nov. 1979 19 p refs
(Contract N00014-77-C-0062)
(AD-A077809; SIT-DL-7-899) Avail: NTIS HC A02/MF A01 CSCL 09/2

This manual accompanies the program listings and a magnetic tape containing two files, one of program OBLIQUE and one (the second) of program OBLIQ02. The programs OBLIQUE and OBLIQ02 plus the program PPEXACT are used in the procedure described herein to compute the blade bending moments of a propeller operating in an oncoming flow inclined to the propeller shaft. The theoretical analysis leading to and the operating of PPEXACT have been described by Tsakonas, et al. GRA

N80-19881# Colorado Univ., Boulder. Dept. of Computer Science.
A SOFTWARE LIFECYCLE METHODOLOGY AND TOOL SUPPORT Interim Technical Report
Leon J. Osterweil Apr. 1979 21 p refs
(Grants DAAG29-78-G-0046; NSF MCS-77-02194)
(AD-A076335; CU-CS-154-79) Avail: NTIS HC A02/MF A01 CSCL 09/2

This paper describes a system of techniques and tools for aiding in the development and maintenance of software. Improved verification techniques are applied throughout the entire process and management visibility is greatly enhanced. The paper discusses the critical need for improving upon past and present methodology. It presents a proposal for a new production methodology, a verification methodology, and the system architecture for a family of support tools. GRA

N80-19882# Stanford Univ., Calif. Dept. of Operations Research.
A BOUNDING TECHNIQUE FOR INTEGER LINEAR PROGRAMMING WITH BINARY VARIABLES
Frederick S. Hillier and Nancy Eileen Jacqmin Jun. 1979 17 p refs
(Contract N00014-76-C-0418; Grant NSF MCS-76-81259)
(AD-A075575; SU-TR-86) Avail: NTIS HC A02/MF A01 CSCL 12/1

We present a bounding technique for use in implicit enumeration algorithms for solving the integer linear programming problem with binary variables. The main assumptions used by this technique are the associated linear program, obtained by dropping the integrality constraints on the variables, possess a unique optimal solution. This optimal solution is not binary, and a good feasible solution to the original problem is available. An alternative to the last assumption which is weaker is also presented. We show that joint bounds can be obtained on the values of a subset of the variables. In addition we given an efficient method to implement this bounding technique. Finally, a class of problems particularly well-suited to this bounding procedure is specified. GRA

N80-19883# National Technical Information Service, Springfield, Va.
NATURAL LANGUAGE PROCESSING, VOLUME 1. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - 1977
Brian Carrigan Dec. 1979 271 p
(PB80-803281) Avail: NTIS HC $30.00/MF $30.00 CSCL 09B

The bibliography of Government-sponsored research cites reports on natural language in many areas of application. Topics such as speech recognition, computer programming, information storage and retrieval, question-answering systems, man computer, communications, artificial intelligence, syntactic analysis, and computational linguistics are included. This updated bibliography contains 271 abstracts, none of which are new entries to the previous edition. GRA

N80-19884# National Technical Information Service, Springfield, Va.
NATURAL LANGUAGE PROCESSING, VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1978 - Dec. 1979
Brian Carrigan Dec. 1979 34 p Supersedes NTIS/PS-78/1312; NTIS/PS-77/1169; NTIS/PS-76/1027; NTIS/PS-75/864
(PB80-803299; NTIS/PS-78/1312; NTIS/PS-77/1169; NTIS/PS-76/1027; NTIS/PS-75/864) Avail: NTIS HC $30.00/MF $30.00 CSCL 09B

The bibliography of Government research cites reports on natural language in many areas of application. Topics such as speech recognition, computer programming, information storage, and retrieval, question-answering systems, man computer communications, artificial intelligence, syntactic analysis, and computational linguistics are included. This updated bibliography contains 64 abstracts, 34 of which are new entries to the previous edition. GRA

N80-19885# National Technical Information Service, Springfield, Va.
NATURAL LANGUAGE PROCESSING. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Dec. 1979
Brian Carrigan Dec. 1979 174 p Supersedes NTIS/PS-78/1313; NTIS/PS-77/1170; NTIS/PS-76/1028
(PB80-803307; NTIS/PS-78/1313; NTIS/PS-77/1170; NTIS/PS-76/1028) Avail: NTIS HC $30.00/MF $30.00 CSCL 09B

The bibliography of worldwide journal literature cites reports on natural language in many areas of applications. Speech recognition, computer programming, information storage and retrieval question-answering systems, man-computer communications, artificial intelligence, syntactic analysis, and computational linguistics are topics included. This updated bibliography contains 174 abstracts, 31 of which are new entries to the previous edition. GRA

N80-19810# Syracuse Univ., N. Y. Dept. of Industrial Engineering and Operations Research.
AN INTRODUCTION TO THE SELECTION AND USE OF SIMULATION LANGUAGES
Robert G. Sargent *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 4 p refs (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

N80-19827# Mitre Corp., Bedford, Mass.
APPLICATION OF COMPUTER SIMULATIONS TO DEVELOPMENT OF NATO E-3A AUTOMATIC TRACK INITIATION ALGORITHMS
E. J. Alvarez and C. J. Sworobowicz *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 21 p (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

N80-19831# Le Materiel Telephonique, Trappes (France).
USING A LANGUAGE DEVELOPED FOR AIRCRAFT SIMULATORS [UTILISATION D'UN LANGAGE EVOLUE POUR LES SIMULATEURS D'AVIONS]
Michel G. Dreyfus *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan.

1980 7 p In FRENCH; ENGLISH summary (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

62 COMPUTER SYSTEMS

Includes computer networks.

N80-19885# Maryland Univ., College Park. Computer Science Center.
LOCAL RECONFIGURATION OF NETWORKS OF PROCESSORS: ARRAYS, TREES, AND GRAPHS Interim Report
Tsvi Dubitzki, Angela Wu, and Azriel Rosenfeld Jul. 1979 27 p refs
(Grant AF-AFOSR-3271-77; AF Proj. 2304)
(AD-A077525; CSC-TR-790; AFOSR-79-1159TR) Avail: NTIS HC A03/MF A01 CSCL 09/4

This paper studies local reconfiguration of trees into arrays and vice versa. It also studies the construction of adjacency graphs and quadtrees for images stored in cellular array processors. GRA

63 CYBERNETICS

Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

N80-19887 Rice Univ., Houston, Tex.
SEQUENTIAL GRADIENT-RESTORATION ALGORITHM FOR OPTIMAL CONTROL PROBLEMS WITH GENERAL BOUNDARY CONDITIONS Ph.D. Thesis
Salvador Gonzalez 1979 87 p
Avail: Univ. Microfilms Order No. 8003861

The numerical solution of two classes of optimal control problems, called Problem P1 and Problem P2 for easy identification are considered. Problem P1 involves a functional 1 subject to differential constraints and general boundary conditions. It consists of finding the state, the control, and the parameter so that the functional 1 is minimized while the constraints and the boundary conditions are satisfied to a predetermined accuracy. Problem P2 extends Problem P1 to include nondifferential constraints to be satisfied along the interval of integration. Algorithms are developed for both Problem P1 and Problem P2. Dissert. Abstr.

N80-19888# Naval Research Lab., Washington, D. C.
PERFORMANCE COLLAPSE DUE TO OVERHEAD IN A SIMPLE, SINGLE-SERVER QUEUEING SYSTEM Final Report
John E. Shore 11 Dec. 1979 25 p refs
(RR0140941)
(AD-A078190; NRL-MR-4126) Avail: NTIS HC A02/MF A01 CSCL 12/1

We consider a simple model of overhead in batch computer systems and message switching systems: an exponential, single-server queueing system with finite storage capacity, constant arrival rate, and queue-length-dependent service time. We consider cases in which the expected service time consists of a constant plus a term that grows linearly or logarithmically with the queue length. We show that the performance of this system--as characterized by the expected number of customers in the system, the expected time in the system, and the rate of missed customers--can undergo a sudden collapse as the result of small changes in the arrival rate, the overhead rate, or the queue capacity. The system has the interesting property that increasing the queue capacity can decrease performance. In addition to equilibrium results, we consider the dynamic behavior of the model. We show that the system tends to operate in either of two quasi-stable modes of operation--one with low queue lengths and one with high queue lengths. System behavior is characterized by long periods of operation in both modes with abrupt transitions between them. We point out that the performance of a saturated system may be improved by dynamic operating procedures that return the system to the low mode. GRA

N80-19889# Princeton Univ., N. J. Dept. of Electrical Engineering and Computer Science.
GENERALIZATIONS OF THE SEQUENTIAL SIGN DETECTOR Interim Report
C. C. Lee and J. B. Thomas 1979 11 p refs Presented at the 17th Ann. Allerton Conf. on Communication, Control, and Computing, Princeton, N.J. 10-12 Oct. 1979 Submitted for publication
(Grant AF-AFOSR-3083-76; AF Proj. 2304)
(AD-A078110; AFOSR-79-1171TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

Some generalizations of the classical ruin problem in probability theory are investigated. These generalizations are applied to analyze the sequential dead-zone limiter detector and the sequential four-level sign detector. The performances of these detectors are then compared to that of the sequential sign detector in terms of the relative efficiency (RE) and the asymptotic relative efficiency (ARE). GRA

N80-19890# Brown Univ., Providence, R. I. Center for Dynamical Systems.
DESIGN OF OPTIMAL TRACKING DISCRETE CONTROL SYSTEM Interim Report
Y. Bar-Ness (Tel Aviv Univ., Israel) and J. Feinstein (Tel Aviv Univ., Israel) Jul. 1979 44 p refs
(Grant AF-AFOSR-3063-77; AF Proj. 2304)
(AD-A078751; AFOSR-79-1284TR) Avail: NTIS HC A03/MF A01 CSCL 14/2

Output feedback with a series compensator is considered for controlling SISO discrete systems. MSE criterion of design is used in tracking a given input sequence. The plant can be unstable and/or nonminimum phase, while the compensator is constrained to be physically realizable and closed-loop configuration is both stable and physically realizable. Using variational methods the required compensator is found, and shown to be the necessary and sufficient optimal solution. GRA

N80-19891# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
AMORD: A DEDUCTIVE PROCEDURE SYSTEM
Johan De Kleer, Jon Doyle, Charles Rich, Guy L. Steele, Jr., and Gerald Jay Sussman Jan. 1978 49 p refs
(Contract N00014-75-C-0643; Grant NSF MCS-77-04828)
(AD-A078417; AI-M-435) Avail: NTIS HC A03/MF A01 CSCL 14/2

AMORD is a system for writing problem solvers. It encourages a style of expression in which the logical relationships of the knowledge and control structure of the problem solver are made explicit. A minimal set of mechanisms is supplied by AMORD so that most of the knowledge that must be formalized and the decisions that must be made in constructing a problem solving program must, to a large degree, be made explicit in AMORD. This makes AMORD a vehicle for expressing the structure of problem solvers. Once the problem solving structure has been formalized, the task of transferral to programs in programming languages is straightforward. The important aspect of AMORD is the discipline of explicit control it enforces, rather than the specific language or syntax in which the control knowledge is expressed. The basic mechanism of AMORD is the pattern-directed invocation of a set of rules operating on an indexed data base of assertions. We have implemented an interpreter for the rule-based system, AMORD, based on a non-chronological control structure and a system of automatically maintained data-dependencies. The purpose of this paper is to serve as a reference manual and as an implementation tutorial. It illustrates: (1) the discipline of explicit control and dependencies; (2) how to use AMORD; and (3) one way to implement the mechanisms provided by AMORD. GRA

N80-19892# Maryland Univ., College Park. Computer Science Center.
REGION REPRESENTATION: QUADTREES FROM BOUNDARY CODES
Hanan Samet Mar. 1979 40 p refs
(Contract DAAG53-76-C-0138; DARPA Order 3206)

(AD-A076350; CSC-TR-741) Avail: NTIS HC A03/MF A01 CSCL 09/4

An algorithm is presented for constructing a quadtree for a region given its boundary in the form of a chain code. The algorithm makes use of some geometrical properties of the region to enable the detection of the maximal size blocks of the region without actually visiting all of the subblocks of the maximal size block. Analysis of the algorithm reveals that its execution time is proportional to the product of the perimeter and the log of the diameter of the region. GRA

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N80-19893 Duke Univ., Durham, N. C.
A RECURSION THEORETIC ANALYSIS OF CERTAIN GENERALIZATIONS OF RAMSEY'S THEOREM AND OF THE GALE-STEWART THEOREM Ph.D. Thesis
Peter George Clote 1979 114 p
Avail: Univ. Microfilms Order No. 8003615

Various combinatorial principles related to Ramsey's theorem are considered. These include square bracket partition relations, Nash-Williams' barrier theorem, Ramsey's theorem for clopen and open sets, and determinateness for clopen and open games. In each case a recursive theoretic analysis is given of the effective versions along with some corresponding results in models of arithmetic. An approximation theorem for the class of hyperarithmetical functions is proved. This theorem permits a close correlation between the 'order type' of a clopen set and the complexity for solutions of a given recursively presented problem. The Gale-Steward theorem is also proved. The recursion theoretic analysis implies that certain combinatorial principles cannot be proved in a weak form of second order arithmetic. By using indicator theory finitary versions of these principles are given which are true but unprovable in first order Peano arithmetic.
Dissert. Abstr.

N80-19894 University of Southwestern Louisiana, Lafayette.
A MODIFICATION OF HUDSON'S TECHNIQUE FOR PIECEWISE LINEAR REGRESSION MODELS Ph.D. Thesis
Aubrey Dale Magoun 1978 102 p
Avail: Univ. Microfilms Order No. 7924277

The methodology in Hudson's iterative least squares procedure for ascertaining solutions to the piecewise regression problem with unknown join points is examined and a modification is presented. It is shown that the use of successive differences and smoothing techniques enhances the estimation problem set forth by the assumptions and models of Hudson. By using successive differences one can estimate point slopes and then test for collinearity versus noncollinearity. This enhances Hudson's technique due to the fact that one now has an estimate of how many piecewise linear splines are present and an interval estimate of the location of each join point. Likewise, using a concept in numerical analysis called divided differences one can also estimate the join point prior to the curve fitting procedure.
Dissert. Abstr.

N80-19895 Ohio State Univ., Columbus.
ON THE PROBLEMS OF CONSTRUCTION AND STATISTICAL INFERENCE ASSOCIATED WITH A GENERALIZATION OF CANONICAL VARIABLES Ph.D. Thesis
Ashis SenGupta 1979 63 p
Avail: Univ. Microfilms Order No. 8001829

Given the partition of a p-dimensional random vector, V, into subvectors, generalized canonical variables (GCVs) are obtained whether or not the pupulation disperion matrix, D, is known. Regardless of the pattern of D, GCVs are constructed such that they are equi-correlated. When X is normally distributed with unknown (known) d, large sample (exact) GCVs are derived. Large sample distributions of the roots of determinantal equations leading to the construction of GCVs are deduced. Tests of hypotheses concerning the value of the generalized variance and the value of the equi-correlation are performed. The hypothesis that the k-vector GCVs is as good as the k+1 vector GCVs tested under large sample approximation. Properties of such tests are also dicussed. Dissert. Abstr.

N80-19896# Lockheed Missiles and Space Co., Palo Alto, Calif. Applied Mechanics Lab.
DESIGN AND IMPLEMENTATION OF A NEW DESCENT ALGORITHM FOR LOCAL OPTIMIZATION Final Report, 15 Jul. 1976 - 15 Sep. 1979
Paul S. Jensen 15 Nov. 1979 61 p refs
(Contract F49620-76-C-0003; AF Proj. 2304)
(AD-A078220; LMSC-D683306; AFOSR-79-1226TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

A new descent algorithm based on direction searches in the osculating plane as opposed to the negative gradient is described. The major practical difference between the implementation to this approach and quasi-Newton algorithms is the use of the Hessian in place of the inverse Hessian. Thus, the descent algorithm is most suitable for problems for which it is practical to recalculate the Hessian a number of times during the solution process. A number of comparative results with popular quasi-Newton algorithms are provided. Extensive discussion of the implementation details is included along with documentation of a convenient computer program CRATER for unconstrained optimization analysis. GRA

N80-19897# Maryland Univ., College Park. Computer Science Center.
LINEAR TIME CALCULATIONS OF GEOMETRIC PROPERTIES USING QUADTREES
Michael Shneier May 1979 17 p refs
(Contract DAAG53-76-C-0138; DARPA Order 3206)
(AD-A078087; TR-770) Avail: NTIS HC A02/MF A01 CSCL 09/2

This paper describes algorithms for computing geometric properties of binary images represented as quadtrees. All the algorithms involve a simple traversal of the tree. Each algorithm, however, performs different operations at the nodes of the tree. Algorithms are presented for finding the area, centroid, union, intersection, and complement of binary images. All the algorithms are linear in the number(s) of nodes in the tree(s). GRA

N80-19898# Naval Ocean Systems Center, San Diego, Calif.
POWER SERIES FOR THE CALCULATION OF BESSEL FUNCTIONS FOR LARGE ARGUMENTS, PROVIDES J SUB NU (X) AND Y SUB NU (X), ACCURATE TO AT LEAST 14 PLACES
P. A. Barakos 1 Oct. 1979 7 p
(SF33334145)
(AD-A077899; NOSC/TD-282) Avail: NTIS HC A02/MF A01 CSCL 12/1

In certain applications such as acoustic wave scattering from internal waves, the Bessel functions J sub nu(x) and Y sub nu(x) for real order and large argument are required to be known accurately to at least 14 figures. Higher order terms in the power series developed by Goldstein and Thaler are presented herein. Applying these results allows J sub nu(x) and Y sub nu(x) to be determined accurately to at least 14 figures. GRA

N80-19899# Ballistic Research Labs., Aberdeen Proving Ground, Md.
SPECIAL FUNCTION SOLUTIONS OF THE DIFFUSION EQUATION Final Report
John F. Polk Jul. 1979 35 p refs
(DA Proj. 1L1-61102-AH-43)
(AD-A075324; AD-E430307; ARBRL-TR-02182) Avail: NTIS HC A03/MF A01 CSCL 12/1

In this report certain special functions are introduced and their properties discussed. In particular they are shown to be solutions of the diffusion(heat) equation satisfying special initial conditions. These functions are then used to obtain approximate solutions to initial-boundary value problems for the diffusion equation which are particularly accurate for small times. GRA

N80-19900# North Carolina Univ. at Chapel Hill. Dept. of Statistics.
NONLINEAR SYSTEMS WITH GAUSSIAN INPUTS: REPRESENTATION, IDENTIFICATION AND INVERSE PROBLEMS Interim Report

Stamatis Cambanis 1979 4 p refs Submitted for publication (Contract AF-AFOSR-2796-75; AF Proj. 2304)
(AD-A078597; AFOSR-79-1212TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The following questions are discussed for nonlinear systems with input Gaussian processes. How can the system be represented? How can the system be identified from the input and output processes? Does knowledge of the way the system responds to a certain Gaussian input determine the way it will respond to another Gaussian input or to a deterministic input? Does knowledge of the system and the statistics of the output determine the statistics of the input? GRA

N80-19901# Stanford Univ., Calif. Dept. of Computer Science.
FAST ALGORITHMS FOR SOLVING TOEPLITZ SYSTEM OF EQUATIONS AND FINDING RATIONAL HERMITE INTERPOLANTS
David Y. Y. Yun Jul. 1979 12 p refs
(Contract N00014-76-C-0330; Grant NSF MCS-77-23738)
(AD-A075376; SU-STAN-CS-79-748) Avail: NTIS HC A02/MF A01 CSCL 12/1

We present a new algorithm that reduces the computation for solving a Toeplitz system to o(n log2 n) and automatically resolves all degenerate cases of the past. Our fundamental results show that all rational Hermite interpolants, including Pade approximants which is intimately related to this solution process, can be computed fast by an Euclidean algorithm. In this report we bring out all these relationship with mathematical justifications and mention important applications including decoding BCH codes. GRA

N80-19902# Massachusetts Inst. of Tech., Cambridge. Information and Decision Systems Lab.
COMBINING AND UPDATING OF LOCAL ESTIMATES AND REGIONAL MAPS ALONG SETS OF ONE-DIMENSIONAL TRACKS Interim Report
Alan S. Willsky, Martin Bello, David A. Castanon, Bernard C. Levy, and George Verghese Nov. 1979 61 p refs
(Contract N00014-76-C-0346; Grant AF-AFOSR-3281-77; AF Proj. 2304)
(AD-A080034; LIDS-P-955; AFOSR-80-0080TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

In this paper we consider the problem of combining and updating estimates that may have been generated in a distributed fashion or may represent estimates, generated at different times, of the same process sample path. The first of these cases has applications in decentralized estimation, while the second has applications in updating maps of spatially-distributed random quantities given measurements along several tracks. The method of solution for the second problem uses the result of the first, and the similarity in the formulation and solution of these problems emphasizes the conceptual similarity between many problems in decentralized control and in the analysis of random fields. GRA

N80-19903# Brown Univ., Providence, R. I. Applied Mathematics Div.
ON THE WEAK CONVERGENCE OF A SEQUENCE OF GENERAL STOCHASTIC DIFFERENCE EQUATIONS TO A DIFFUSION Interim Report
H. J. Kushner and Hai Huang Oct. 1979 44 p refs
(Contract N00014-76-C-0279; Grants AF-AFOSR-3063-88; NSF ENG-77-12946; AF Proj. 2304)
(AD-A080082; AFOSR-80-0014TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

A convenient and useful method for showing weak convergence, to a diffusion of the interpolated solutions of a (not necessarily Markovian) sequence of stochastic difference equations is developed. The technique involves the use of averaging methods to show that the weak limit satisfies the martingale problem of Strook and Varadhan which is associated with the diffusion. A truncation method is developed so that it is only necessary to work with the parts of the process before first escape from an arbitrary but bonded domain. The assumptions cover a wide variety of applications in systems theory, mathematical biology and elsewhere but the method of proof is adaptable to other special cases where our particular assumptions might not hold. Two applications are given in order to illustrate the relative ease of use of the method. The driving noise process in the difference equations can depend on the solution process of the difference equation, and one application where this is useful is given (a rate of convergence problem for simple stochastic approximations with sequentially averaged observations). GRA

N80-19904# Pittsburgh Univ., Pa. Learning Research and Development Center.
CONSTRUCTIONS IN GEOMETRY PROBLEM SOLVING
James G. Greeno 27 Aug. 1979 116 p refs
(Contract N00014-78-C-0022; RR0420602; NR Proj. 157-408)
(AD-A076338; LRDC-1979/8; TR-3) Avail: NTIS HC A06/MF A01 CSCL 12/1

The primary purpose of the report is to provide documentary evidence relevant to a model of planning knowledge that provides an explanation of constructions. The protocols are consistent with the general features of the model, but also show ways in which human problem solving involves processes more complex than those in the model. Illustrations of interaction between formal and informal reasoning processses are also noted. GRA

N80-19905# Pittsburgh Univ., Pa. Learning Research and Development Center.
THEORY OF CONSTRUCTIONS AND SET IN PROBLEM SOLVING
James G. Greeno, Maria E. Magone, and Seth Chaiklin 27 Aug. 1979 67 p refs
(Contract N00014-78-C-0022; RR0520602)
(AD-A076339) Avail: NTIS HC A04/MF A01 CSCL 12/1

Hierarchically organized knowledge about actions has been postulated to explain planning in problem solving. Perdix, a simulation of problem solving in geometry with schematic planning, knowledge is described. Perdix: planning knowledge enables it to augment the problem space it is given by constructing auxiliary lines. The planning system also provides a mechanism that can result in problem-solving set. Results of three experiments involving set and constructions seem consistant with the kinds of knowledge structures hypothesized in the model. Protocols given during solution of 11 geometry problems showed general agreement with the explanation of construction and set based on planning knowledge, but also indicated processes of human problem solving not represented in the model. Finally, the explanation of constructions is discussed in relation to the general question of ill-structured problems and creativity, and the explanation of set is discussed in relation to other phenomena in the problem-solving literature, including functional fixedness. GRA

N80-19906# Wisconsin Univ. - Madison. Mathematics Research Center.
ONE-SIDED CONTINUOUS DEPENDENCE OF MAXIMAL SOLUTIONS Summary Report
Eric Schechter Nov. 1979 23 p refs
(Contract DAAG29-75-C-0024; Grant NSF MCS-78-09525)
(AD-A079722; MRC-TSR-2016) Avail: NTIS HC A02/MF A01 CSCL 12/1

Existence of a maximal solution is proved for a differential equation satisfying a one-sided variant of Caratheodory's condition. The maximal solution is shown to dominate all solutions of a very general differential inequality. Also a best-possible condition is proved for the dependence of the maximal solution on the initial data and on the right-hand side of the equation. GRA

N80-19907# Wisconsin Univ. - Madison. Mathematics Research Center.
DISPERSION MAPPING THEOREMS Summary Report
R. Creighton Buck Sep. 1979 21 p refs
(Contract DAAG29-75-C-0024; Grant NSF MCS-78-07244)
(AD-A079704; MRC-TSR-1995) Avail: NTIS HC A02/MF A01 CSCL 12/1

A function of three variables is often regarded as inherently simpler than a function of five variables, and there has been much attention given to the nature of complicated functions that can be expressed exactly in various ways in terms of simpler functions. From the viewpoint of computation, however, it is sufficient if a function F can be approximated arbitrarily well by combinations of simple functions. This paper deals with

the general structure of this process, and obtains specific theorems that help to describe its limitations, and necessary conditions on the functions F for which this is possible. More detailed applications will be made in the future. GRA

N80-19908# California Univ., Livermore. Lawrence Livermore Lab.
NOTE ON NORMALIZATION OF VARIABLES AND EQUATIONS
A. A. Mirin Mar. 1979 8 p refs
(Contract W-7405-eng-48)
(UCID-18083) Avail: NTIS HC A02/MF A01

It is shown that with 64-bit computer words and exponent ranges of several hundred, care must be exercised to avoid excessive roundoff error when solving coupled systems of partial differential equations. The proper normalization of variables is given as a remedy and an illustration of the procedure is presented. DOE

N80-19909# Addis Translations International, Portola Valley, Calif.
SOLUTIONS TO WAVE EQUATIONS USING AN ARTIFICIAL VISCOSITY METHOD
V. M. Goloviznin, A. A. Samarskii, and A. P. Favorskii Jun. 1979 39 p refs Transl. into ENGLISH of Preprint No. 70 Inst. Prikladnoj Matematiki (Moscow), 1976 Prepared for California Univ., Livermore. Lawrence Livermore Lab.
(UCRL-Trans-11492; Preprint-70) Avail: NTIS HC A03/MF A01

Artificial viscosity is introduced for the solution of flows with shock waves accompanied by increasing entropy. Linear artificial viscosity does not distort the eigenfunctions of the original differential-difference and difference equation linearized about the equilibrium position. The numerical value of the coefficient is selected in the presence of artificial viscosity based on the conditions of the most rapid attenuation of the high frequency oscillations defined by the linearized equations. The stability of linearized systems of equations in two-dimensional Cartesian and cylindrical coordinates in arbitary calculation meshes is investigated. K.L.

N80-19910# Oak Ridge National Lab., Tenn.
BALANCING THE GENERALIZED EIGENVALUE PROBLEM
R. C. Ward Oct. 1979 44 p refs
(Contract W-7405-eng-26)
(ORNL/CSD-47) Avail: NTIS HC A03/MF A01

An algorithm is presented for balancing the A and B matrices prior to computing the eigensystem of the generalized eigenvalue problem Ax = lambda Bx. The three-step algorithm is specifically designed to precede the QZ-type algorithms, but improved performance is expected from most eigensystem solvers. The balancing algorithm computes permutations and two-sided diagonal transformations which are applied to A and B to produce matrices with certain desirable properties. Test cases are presented to illustrate the improved accuracy of the computed eigenvalues. DOE

N80-19911# Maryland Univ., College Park. Inst. for Physical Science and Technology.
FINITE ELEMENT METHOD FOR THE TRICOMI PROBLEM
A. K. Aziz and A. Werschulz (Maryland Univ., Baltimore County) Jul. 1979 17 p refs
(Contract EY-76-S-05-3443)
(ORO-3443-84; BN-913) Avail: NTIS HC A02/MF A01

The numerical solution of a class of second order equations of elliptic-hyperbolic type for phi(x) by the finite element method is addressed by solution of the equivalent first order system for the gradient of phi. The problem to be solved is described. Then an a priori error estimate is proved, and the coercivity of the bilinear form to be used is established. Next, the finite element method for general subspaces is described, and a general error bound is established. Finally, it is shown that the L sub 2 rate of convergence for linear elements may be increased from O(h) to O(h/sup 3/2/) by writing the subspace as a direct sum in a new way. DOE

N80-19912# National Technical Information Service, Springfield, Va.
INTEGRATION OF NONLINEAR DIFFERENTIAL EQUATIONS. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1970 - Nov. 1979
Brian Carrigan Dec. 1979 214 p Supersedes NTIS/PS-78/1194; NTIS/PS-77/1058; NTIS/PS-76/0932; NTIS/PS-75/794; NTIS/PS-75/028
(PB80-802978; NTIS/PS-78/1194; NTIS/PS-77/1058; NTIS/PS-76/0932; NTIS/PS-75/794; NTIS/PS-75/028) Avail: NTIS HC $30.00/MF $30.00 CSCL 12A

Research is cited on the numerical integration of nonlinear differential equations. Included are variational methods, finite difference methods, Laplace transform techniques, Runge-Kutta methods, and conjugate gradient methods as well as solutions to two point boundary value problems and multipoint boundary value problems. This updated bibliography contains 207 abstracts, 36 of which are new entries to the previous edition. GRA

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N80-19913 Wisconsin Univ. - Madison.
EXTENSIONS OF THE BOX-COX TRANSFORMATION TO GROUPED-DATA SITUATIONS Ph.D. Thesis
Victor Manuel Guerro-Guzman 1979 154 p
Avail: Univ. Microfilms Order No. 7928642

The domain of application of the Box-Cox family of power transformations to include several grouped data situations is presented. Three main cases are: (1) one-dimensional data, (2) two dimensional data and (3) binary response models. The transformation is used as a normalizing technique to smooth count data. Both data which are completely grouped and data which are a mixture of grouped and exact observations are considered. Correlation tables, bivariate normal regression, and simple linear regression are also emphasized. It is shown that the Box-Cox transformation helps to improve the validity of the normal theory assumptions. Dissert. Abstr.

N80-19914 Cornell Univ., Ithaca, N. Y.
DISPERSION, PATTERNED AND STRUCTURED MATRICES: VEC OPERATORS AND RELATED TOPICS Ph.D. Thesis
Harold Victor Henderson 1979 192 p
Avail: Univ. Microfilms Order No. 8003936

A review of the vec operator which stacks the columns of a matric one under the other to form a single vector of all elements in the matrix, and an associated permutation matrix, called a vec- permutation matrix are discussed. A definition is given for a vec permutation matrix which leads to considerably simpler proofs of many results of current interest, including a property of reversing the order in Kronecker products. A variation of the vec operator, known as the vech operator, is described. For X square, vechX is defined in the same way as vecX, except that for each column of X only that part of it which is on or below the diagonal is put into vechX. Uses for vec and in multivariate analysis, in matrix differentation and in deriving Jacobians are also discussed. Dissert. Abstr.

N80-19915 Texas A&M Univ., College Station.
A DENSITY-QUANTILE FUNCTION APPROACH TO CHOOSING ORDER STATISTICS FOR THE ESTIMATION OF LOCATION AND SCALE PARAMETERS Ph.D. Thesis
Randall Lester Eubank 1979 130 p
Avail: Univ. Microfilms Order No. 8003125

A general approach to optimal spacings selection is presented that utilizes design technique for continuous parameter time series regression. This methodology is applied to several common distributions. The problems of optimal order statistic selection for estimation in censored samples, for quantile estimation and for summarizing large data sets are also considered. Dissert. Abstr.

N80-19916# Princeton Univ., N. J. Dept. of Statistics.
PREDICTING UNOBSERVABLE VALUES AND ESTIMATING MISSING ONES: A COORDINATE-FREE APPROACH, PART 2

Anne M. Houtman Jul. 1979 12 p refs
(Contract N00014-79-C-0322)
(AD-A078241; TR-156-Ser-2) Avail: NTIS HC A02/MF A01 CSCL 14/1

The solution to the missing value equation in designed experiments with general covariance structure is shown to be identical to the 'best' predictor of the missing data based on the observed data. GRA

N80-19917# Kentucky Univ., Lexington. Dept. of Mathematics.
A STOCHASTIC REALIZATION APPROACH TO THE SMOOTHING PROBLEM. REVISED Interim Report
Faris Badawi, Anders Lindquist, and Michele Pavon 1979 34 p refs Supersedes AFOSR-79-0808TR
(Grant AF-AFOSR-3519-78; AF Proj. 2304)
(AD-A078137; AFOSR-79-1274TR; AFOSR-79-0808TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

The purpose of this paper is to develop a theory of smoothing for finite dimensional linear stochastic systems in the context of stochastic realization theory. The basic idea is to embed the given stochastic system in a class of similar systems all having the same output process and the same Kalman-Bucy filter. This class has a lattice structure with a smallest and a largest element; these two elements completely determine the smoothing estimates. This approach enables us to obtain stochastic interpretations of many important smoothing formulas and to explain the relationship between them. GRA

N80-19918# Naval Postgraduate School, Monterey, Calif.
PREDICTION INTERVALS FOR FIRST ORDER MARKOV PROCESSES M.S. Thesis
T. S. Murthy Sep. 1979 71 p refs
(AD-A078283) Avail: NTIS HC A04/MF A01 CSCL 12/1

A prediction interval is an interval that contains a future observation with a pre-specified probability. The limits of the interval are functions of known observations from a family of known distributions with given parameters. Though prediction intervals resemble confidence intervals, they differ from the latter conceptually. A confidence interval covers the value of a parameter of a distribution. A prediction interval, on the other hand, encloses the value of a random variable. GRA

N80-19919# North Carolina Univ. at Chapel Hill. Inst. of Statistics.
ON THE ASYMPTOTIC DISTRIBUTION OF U-STATISTICS Interim Report
Alan J. Lee Sep. 1979 15 p refs
(Contract AFOSR-75-2796)
(AD-A078117; MIMEO-SER-1255; AFOSR-79-1188TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The asymptotic distribution of a U-statistic is found in the case when the corresponding Von Mises functional is stationary of order 1. Practical methods for the tabulation of the limit distributions are discussed, and the results extended to certain incomplete U-statistics. GRA

N80-19920# North Carolina Univ. at Chapel Hill. Inst. of Statistics.
TRIMMING THE LEAST SQUARES ESTIMATOR IN THE LINEAR MODEL BY USING A PRELIMINARY ESTIMATOR Interim Report
Raymond J. Carroll and David Ruppert Apr. 1979 22 p refs
(Contracts AFOSR-75-2796; NSF MCS-78-01240)
(AD-A078115; MIMEO-Ser-1220; AFOSR-79-1036TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

In this paper a class of estimators is investigated that represent a third possible method of defining a regression analogue of the trimmed mean. GRA

N80-19921# North Carolina Univ. at Chapel Hill. Inst. of Statistics.
ROBUST METHODS FOR FACTORIAL EXPERIMENTS WITH OUTIERS Interim Report
Raymond J. Carroll Jul. 1979 16 p refs
(AF Proj. 2304; AF-AFOSR-2796-75)
(AD-A077890; MIMEO-SER-1244; AFOSR-79-1097TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Two factorial experiments with possible outliers are reanalyzed by means of robust regression techniques. We show that using M-estimates of regression results in efficient analyses which are easier to implement than the methods previously proposed. GRA

N80-19922# North Carolina Univ. at Chapel Hill. Inst. of Statistics.
ON THE ASYMPTOTIC NORMALITY OF ROBUST REGRESSION ESTIMATES Interim Report
Raymond J. Carroll and David Ruppert Jul. 1979 13 p refs
(Grants AF-AFOSR-2796-75; NSF MCS-78-01240)
(AD-A077888; MIMEO-SER-1242) Avail: NTIS HC A02/MF A01 CSCL 12/1

Huber's (1973) proof of asymptotic normality of robust regression estimates is modified to include the estimates used in practice, which have unknown scale and only piecewise smooth defining functions psi. GRA

N80-19923# Claremont Mens Coll., Calif. Inst. of Decision Science.
DELTA-EXACT LOWER CONFIDENCE BOUNDS FOR SERIES SYSTEM RELIABILITY
James B. Lucke and Janet Myhre Sep. 1979 25 p refs
(Contract N00014-78-C-0213)
(AD-A077524; Rept-79-2) Avail: NTIS HC A02/MF A01 CSCL 14/4

Recent modifications of the Likelihood Ratio method of computing lower confidence bounds for series system reliability are shown to have properties necessary for accurate application to actual data. This is shown by comparing various methods using simulations. GRA

N80-19811# Syracuse Univ., N. Y. Dept. of Industrial Engineering and Operations Research.
AN INTRODUCTION TO STATISTICAL ANALYSIS OF SIMULATION OUTPUT DATA
Robert G. Sargent *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 13 p refs Presented at the ACM 1976 Symp. on the Simulation of Computer Systems (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N80-19924# Hanford Engineering Development Lab., Richland, Wash.
PERFORMANCE MEASUREMENT SYSTEM: RECENT SYSTEMS DEVELOPMENT AND APPLICATIONS
R. A. Rigney 28 Mar. 1979 15 p refs Presented at 6th Internet Intern. Management System Assoc. Meeting, Garmisch-Partenkirchen, West Germany, 24 Sep. 1979
(Contract EY-76-C-14-2170)
(HEDL-SA-1826-FP; CONF-790988-1) Avail: NTIS HC A02/MF A01

The performance measurement system (PMS), a system for managing a given project or program, is described. This system incorporates the value earned for work accomplished approach. Development and application of this system is discussed under the following headings: PMS vs conventional management control systems; PMS implementation on a project/program; PMS data elements (organization, planning and budgeting, accounting, analysis, reports and performance measurement data elements); PMS applications (FFTF, CRBRP, FMEF, and FMIT). DOE

N80-19818# Shape Technical Center, The Hague (Netherlands).
SIMULATION OF AIR DEFENCE OPERATIONS AND MULTIPLE AIR COMBAT
H. R. Wilhelm *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 20 p (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

N80-19819# NATO Programming Centre, Tongeren (Belgium).
SIMULATION WITHIN MILITARY DEFENCE SYSTEMS FOR TRAINING AND EVALUATION
Hans-Jochen Wunschmann *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 14 p (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

N80-19820# Institute of Aviation Medicine, Farnborough (England).
REAL-TIME SIMULATION: AN INDISPENSABLE BUT OVERUSED EVALUATION TECHIQUE
V. David Hopkin and A. J. McClumpha *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 6 p refs (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

N80-19821# Elektronik-System G.m.b.H., Munich (West Germany).
DESIGN AND SIMULATION OF A C3 SYSTEM FOR SURVEILLANCE PURPOSE
Franz Herzmann and Helmut Sanders *In* AGARD Modelling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 13 p refs (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

N80-19822# Royal Signals and Radar Establishment, Malvern (England).
SIMBOX: A GENERAL PURPOSE DEFENSE SYSTEMS SIMULATOR
B. Davy *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 8 p (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

N80-19823# Mitre Corp., Bedford, Mass.
THE APPLICATION OF MODELING AND SIMULATION TO THE DEVELOPMENT OF THE E-3A
A. R. Shanahan *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 14 p (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

N80-19824# Analytic Sciences Corp., Reading, Mass.
E-3A NAVIGATIONAL COMPUTER SYSTEM REAL-TIME ENVIRONMENTAL SIMULATOR
Richard D. Healy and Samuel Newman *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 8 p refs Prepared in cooperation with NADC, Warminster, Pa. (For primary document see N80-19809 10-59)
(Contract N62269-79-C-0020)
Avail: NTIS HC A24/MF A01

N80-19825# Boeing Aerospace Co., Seattle, Wash.
A JTIDS PERFORMANCE MODEL FOR THE E-3A
James G. Taylor *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 13 p refs (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

N80-19826# Marconi Space and Defence Systems Ltd., Hillend (Scotland).
A MISSION TRAINING SIMULATOR FOR THE NIMROD MR MK 2 AND SOME ASPECTS OF THE DERIVATION AND VERIFICATION OF ITS SYSTEM MODELS
K. Wells *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 6 p (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

N80-19833# Institute for Defense Analyses, Arlington, Va. Systems Evaluation Div.
USE OF SIMULATION IN THE EVALUATION OF THE IFFN PROCESS
J. E. Freedman and S. H. Starr *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 20 p ref (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

N80-19834# Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (West Germany).
AIR-TO-AIR ENGAGEMENT SIMULATION
Goetz Wunderlich and Roland Braun *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 14 p (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

N80-19835# Mitre Corp., Bedford, Mass.
THE MITRE INTERACTIVE COMMUNICATIONS ANALYSIS PROGRAM (MICAP)
John M. Ruddy *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 22 p (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

N80-19836# Societe Nationale Industrielle Aerospatiale, Toulouse (France).
NEW POSSIBILITIES OFFERED BY A RADIO-INERTIAL HYBRID GUIDANCE SYSTEM DIGITAL SIMULATION STUDY [NOUVELLES POSSIBILITIES OFFERTES PAR UN SYSTEME DE GUIDAGE HYBRIDE RADIO - INERTIEL ETUDIE EN SIMULATION NUMERIQUE]
D. Buisson, J. Irvoas, and J. Grossin *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 25 p In FRENCH; ENGLISH summary refs (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

N80-19841# Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (West Germany).
FIRE CONTROL FOR AIR-TO-AIR GUNNERY IN HIGH PERFORMANCE FIGHTER AIRCRAFT
Hans W. Pongratz *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 13 p (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

N80-19842# Electronique Marcel Dassault, St. Cloud (France).
SIMULATION FOR INTEGRATION WITH DYNAMIC TESTS OF THE LOGICAL ELEMENTS OF PRINCIPAL ONBOARD COMPUTERS [SIMULATEUR POUR INTEGRATION AVEC TESTS DYNAMIQUES DES LOGICIELS DE CALCULATEURS ENTRAUX EMBARQUES]
E. Bouthors *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 11 p In FRENCH (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

N80-19844# National Aerospace Lab., Amsterdam (Netherlands).
A FLIGHT SIMULATION INVESTIGATION ON THE FEASIBILITY OF CURVED APPROACHES UNDER MLS GUIDANCE
L. J. J. Erkelens *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 18 p refs (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

N80-19845# Boston Univ., Mass.
MODELING AND FLIGHT SIMULATION OF AN ACTIVE CONFIGURED AIRCRAFT UNDER M.L.S. GUIDANCE
A. Danesi, S. Smolka, and U. Chinappi *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 16 p Prepared in cooperation with Rome Univ., Italy (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

N80-19846# Naval Air Development Center, Warminster, Pa.
MODELING THE HUMAN OPERATOR: APPLICATIONS TO SYSTEM COST EFFECTIVENESS
Norman E. Lane, Melvin I. Strieb (Analytics, Inc., Willow Grove, Pa.), and Walter Leyland *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan.

1980 13 p refs (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

N80-19847# Naval Air Development Center, Warminster, Pa.
PREDICTING FIELD OF VIEW REQUIREMENTS FOR VSTOL AIRCRAFT APPROACH AND LANDING
Paul M. Linton and Warren F. Clement *In* AGARD Modeling and Simulation of Avionics Systems and Command, Control and Commun. Jan. 1980 17 p refs Prepared in cooperation with Systems Technology, Inc., Mountain View, Calif. (For primary document see N80-19809 10-59)
Avail: NTIS HC A24/MF A01

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N80-19925 Pittsburgh Univ., Pa.
GENERALIZATIONS OF COMPACTNESS AND CARDINAL INVARIANTS OF SPACES Ph.D. Thesis
Mohammad Ismail 1979 108 p
Avail: Univ. Microfilms Order No. 8004861

The relationships among the cardinal invariants of topological spaces and also among properties such as countable tightness, sequential, and first countability for compact Hausdorff and related spaces are investigated. The concept of left-separated spaces is considered along with basic properties. The spaces of pointwise countable type, k-spaces, and sequential spaces are examined along with their cardinal variants. The invariants of homogeneous spaces and topological groups of pointwise countable type and the spaces in which countably compact sets are closed are also studied. Hereditary properties are examined. Results are presented and discussed. Dissert. Abstr.

N80-19926# South Carolina Univ., Columbia. Dept. of Mathematics Computer Science and Statistics.
ON THE WEAK LAW OF LARGE NUMBERS D(0,1) Interim Report
Robert Lee Taylor Jun. 1979 14 p refs
(Contract F49620-79-C-0140)
(AD-A078130; AFOSR-79-1038TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Weak laws of large numbers are obtained for random elements in D(0,1) where the convergence is in the sup-norm topology. For identically distributed random elements satisfying a compact integral condition, the weak law of large numbers holding pointwise is shown to be necessary and sufficient for the weak law of large numbers. In addition to a discussion of the compact integral condition, a weak law of large numbers is obtained for monotone increasing random elements, and convergence of weighted sums of independent, identically distributed random elements is obtained. GRA

N80-19927# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Labs.
DIFFERENTIAL GEOMETRY, SURFACE PATCHES AND CONVERGENCE METHODS
W. E. L. Grimson Feb. 1979 39 p refs
(Contract N00014-75-C-0643; Grant NSF MCS-77-07569)
(AD-A078061; AI-M-510) Avail: NTIS HC A03/MF A01 CSCL 06/4

The problem of constructing a surface from the information provided by the Marr-Poggio theory of human stereo vision is investigated. It is argued that not only does this theory provide explicit boundary conditions at certain points in the image, but that the imaging process also provides implicit conditions on all other points in the image. This argument is used to derive conditions on possible algorithms for computing the surface. Additional constraining principles are applied to the problem; specifically that the process be performable by a local-support parallel network. Some mathematical tools, differential geometry, Coons surface patches and iterative methods of convergence, relevant to the problem of constructing the surface are outlined. Specific methods for actually computing the surface are examined. GRA

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

No abstracts in this category.

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N80-19928 British Broadcasting Corp., Kingswood (England). Research Dept.
SURFACE ACOUSTIC WAVES: EXPERIMENTAL DEVICE FABRICATION
A. Roberts and K. Hacking Dec. 1979 18 p refs
(BBC-RD-1979/29) Avail: BBC, Kingswood Warren, Tadsworth, Surrey, Engl.

An experimental surface acoustic wave (SAW) device production technique developed, using a steeping camera and safe chemical process is described. Devices can be made, operating in the frequency range from 15 to 100 MHz on a variety of piezoelectric substrates. Delays, frequency filters, and resonators are the most common device, but convolvers, dispersive filters, and many other types can be produced. The camera has proved accurate and reliable; its operation is automatically controlled from a punched data tape. The chemical processes require a high standard of care and cleanliness to achieve consistent results, but are capable of producing working devices up to 100 MHz. The stepping camera and the chemical processes are described, together with a brief introduction to the subject of surface acoustic waves. J.M.S.

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N80-19929*# Nebraska Univ. - Lincoln. Behlen Lab. of Physics.
DISSOCIATIVE AND DOUBLE PHOTOIONIZATION OF CO2 FROM THRESHOLD TO 90 A
Toshio Masuoka and James A. R. Samson [1979] 36 p
(Grant NGR-28-004-021)
(NASA-CR-162844) Avail: NTIS HC A03/MF A01 CSCL 20H

The molecular photoionization, dissociative photoionization and double photoionization cross sections for CO2 were measured from their onsets down to 90 A by using various combinations of mass spectrometers (a coincidence time-of-flight mass spectrometer and a magnetic mass spectrometer) and light sources (synchrotron radiation, and glow and spark discharge). It is concluded that the one broad peak and the three shoulders in the total adsorption cross section curve between 640 and 90 A are caused completely by dissociative ionization processes. Several peaks observed in the cross section curve for the total fragmentation CO(+)3, O(+) and C(+) are compared with those in the photoelectron spectrum reported for CO2. A.R.H.

N80-19930# Brookhaven National Lab., Upton, N. Y.
CLUSTER EFFECTS ON CHARGE STATE DISTRIBUTIONS FOR HEAVY ION MOLECULAR BEAMS
P. Thieberger 1979 11 p refs
(Contract EY-76-C-02-0016)
(BNL-26765) Avail: NTIS HC A02/MF A01

The charge state distributions of ions emerging from carbon foils, compared for equal velocity monoatomic and polyatomic negative ions incident on the foil are discussed. Such compari-

ions were performed for O2(-) vs O(-) and for C3(-) vs C(-) and C4(-) vs C(-). Measured charge state distributions are shown for carbon and oxygen respectively and how the observed effect varies with foil thickness for the oxygen case. In all cases, the distribution is shifted toward lower average charge states for the molecular beams and the effect persists even though attenuated up to and including the thickest foils used. The most straightforward interpretation of these results is that for each component of the cluster there are more correlated electrons available for pickup than for single ions. DOE

N80-19931# Washington Univ., Seattle.
FIELD THEORY OF PION-NUCLEUS INTERACTIONS
G. A. Miller 1979 7 p refs Presented at Ann. Conf. of the Am. Inst. of Physics, Houston, Tex., Feb. 1979
(Contract EY-76-C-06-1388)
(DOE/ER-01388-775; RLO-1388-775; CONF-790242-1) Avail: NTIS HC A02/MF A01

Some approximate solutions of the Low equations for pi-nucleon scattering, pi-nuclear scattering and the pp yields d pi(+) reaction are discussed. Results differ from those of other treatments by the inclusion of propagator modifications which act as cutoffs for terms involving pions of relatively small momenta. Because of these propagator modifications the use of a pi-nucleon T-matrix of long range is perfectly consistent with the idea that the fundamental pi-nucleon form factor is of very short range. The origin of these propagator modifications is shown to be a proper evaluation of the energy dependence of the off-shell pi-nucleon scattering amplitude. As a consequence of the theory, good agreement with pp yields d pi(+) data is obtained without the inclusion of large effects from rho-meson exchange terms. DOE

N80-19932# Virginia Univ., Charlottesville.
EXPERIMENTS ON THE NUCLEAR INTERACTIONS OF PIONS Progress Report, 1 Dec. 1979 - 30 Nov. 1980
R. C. Minehart and K. O. H. Ziock 1979 21 p refs
(Contract EY-76-S-05-4043)
(ORO-4043-39) Avail: NTIS HC A02/MF A01

Research on pion reactions is reported. A list of publications and an abstract of given reports are presented. A number of abstracts of talks to be given at meetings are included. Topics addressed include the elastic scattering of pions, pion quasifree scattering on cadmium isotopes, and pion double charge exchange on calcium isotopes. A.W.H.

N80-19933# Stanford Linear Accelerator Center, Calif.
NUCLEAR PHENOMENA AND THE SHORT DISTANCE STRUCTURE OF HADRONS
S. J. Brodsky Sep. 1979 47 p refs
(Contract EY-76-C-03-0515)
(SLAC-Pub-2395) Avail: NTIS HC A03/MF A01

Topics involving nuclear collisions and their relation to aspects of quantum chromodynamics are discussed. These include: hadronic production in hadron-nucleus, lepton-nucleus, and nucleus-nucleus collisions; the question of shadowing in deep inelastic nuclear reactions; and the structure of the nuclear wave function at very short distances. A.W.H.

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N80-19934 Colorado Univ. at Boulder.
THE ELASTIC AND INELASTIC SCATTERING OF 0.8 GeV PROTONS BY Y-89 AND Zr-90 Ph.D. Thesis
Nicholas Joseph DiGiacomo 1979 253 p
Avail: Univ. Microfilms Order No. 8002967

The optical model and collective model DWBA approach to proton elastic and inelastic scattering was extended to momentum tranfer of four inverse Fermis. Elastic and inelastic proton scattering data at 0.8 GeV were taken on the middle mass nuclei Y-89 and Zr-90 with the high resolution spectrometer. The data were analyzed within the optical model and collective model DWBA and the results compared to similar analyses performed at projectile energies of 18 to 180 MeV. Approximations made in the theory to include relativistic effects were tested. The energy dependence of the projectile-nucleus empirical optical potential was clarified and a detailed optical model analysis of the elastic scattering was performed. The elastic and inelastic cross sections were found to be insensitive to the inclusion of spin orbit effects. Dissert. Abstr.

N80-19935*# United Technologies Corp., East Hartford, Conn.
ARGON/UF6 PLASMA EXPERIMENTS: UF6 REGENERATION AND PRODUCT ANALYSIS
Ward C. Roman Washington NASA Mar. 1980 93 p refs
(Contract NAS1-14329)
(NASA-CR-3258) Avail: NTIS HC A05/MF A01 CSCL 20I

An experimental and analytical investigation was conducted to aid in developing some of the technology necessary for designing a self-critical fissioning uranium plasma core reactors (PCR). This technology is applicable to gaseous uranium hexafluoride nuclear-pumped laser systems. The principal equipment used included 1.2 MW RF induction heater, a d.c. plasma torch, a uranium tetrafluoride feeder system, and batch-type fluorine/UF6 regeneration systems. Overall objectives were to continue to develop and test materials and handling techniques suitable for use with high-temperature, high-pressure, gaseous UF6; and to continue development of complementary diagnostic instrumentation and measurement techniques to characterize the effluent exhaust gases and residue deposited on the test chamber and exhaust system components. Specific objectives include: a development of a batch-type UF6 regeneration system employing pure high-temperature fluorine; development of a ruggedized time-of-flight mass spectrometer and associated data acquisition system capable of making on-line concentration measurements of the volatile effluent exhaust gas species in a high RF environment and corrosive environment of UF6 and related halide compounds. A.R.H.

N80-19936# Naval Research Lab., Washington, D. C.
THEORY OF THE RESISTIVE HOSE INSTABILITY IN RELATIVISTIC ELECTRON BEAMS
Han S. Uhm and Martin Lampe 26 Nov. 1979 48 p refs
(ARPA Order 3718)
(AD-A078189; NRL-MR-4111) Avail: NTIS HC A03/MF A01 CSCL 20/7

A Vlasov-Maxwell theory of the resistive hose instability is developed for an infinitely long relativistic electron beam propagating parallel to an applied axial magnetic field. Complete space charge neutralization by the ambient plasma, and paraxial flow (p(z)p:2 >> p(r)p:2 + p(theta)2 mu) are assumed. The analysis is performed for rigid-rotor and cold laminar flow equilibria. An integro-differential eigenvalue equation is obtained for the general case, and is reduced to an ordinary differential equation in either the cold laminar flow limit or the case of a square beam density profile. Using a variational technique, an approximate dispersion relation is found for arbitrary density profile, and evaluated in closed form for either the Bennett or square profile. Stability properties are illustrated and discussed in detail for a square profile, including the influence of the applied magnetic field (stabilizing), proximity to a conducting guide (stabilizing), and partial current neutralization (destabilizing). GRA

N80-19937# Los Alamos Scientific Lab., N. Mex. Health Research Div.
NUCLEAR WASTE MANAGEMENT TECHNOLOGY DEVELOPMENT ACTIVITIES Progress Report, Jan. - Dec. 1978
L. J. Johnson, comp. and B. H. Desilets, comp. Jun. 1979 75 p refs
(Contract W-7405-eng-36)
(LA-7921-PR) Avail: NTIS HC A04/MF A01

Development and application of assay instrumentation for measuring the radioactivity content of waste packages is reported. Work in developing test materials and laser-based instrumentation for in-place testing of high-efficiency particulate aerosol filters is discussed. Development and demonstration of a controlled air incinerator for treatment of radioactively contaminated combustible waste is described. Field data from the environmental geology

and hydrology aspect of shallow earth disposal of radioactively contaminated waste are reviewed and related to improvement of land burial technology. DOE

N80-19938# Washington Univ., Seattle. Dept. of Physics.
TESTING QUANTUM CHROMODYNAMICS IN ELECTRON-POSITRON ANNIHILATION AT HIGH ENERGIES
L. S. Brown 1979 13 p refs Presented at Orbis Scientiae 1979 Conf., Coral Gables, Fla., 15 Jan. 1979
(Contract EY-76-C-06-1388)
(DOE/ER-01388-777; RLO-1388-777; CONF-790150-6) Avail: NTIS HC A02/MF A01

Various measures of the distribution of hadronic energy produced in high energy electron-position annihilation provide precise tests of the promising fundamental theory of hadronic physics, quantum chromodynamics. Recent work on such energy cross section is reviewed. DOE

N80-19939# Battelle Pacific Northwest Labs., Richland, Wash.
STRESS ANALYSIS OF HIGH-LEVEL WASTE CANISTERS: METHODS, APPLICATIONS, AND DESIGN DATA
F. A. Simonen and S. C. Slate Oct. 1979 158 p refs
(Contract EY-76-C-06-1830)
(PNL-3038) Avail: NTIS HC A08/MF A01

An overview of stress analysis methods, structural design procedures, and design data is presented for canisters used to package solidified wastes, particularly borosilicate glass. In addition, waste processing, canister materials, fabrication and inspection methods, and performance testing are summarized. Sources of stress in canisters are lifting and handling loads, internal pressure, high temperature filling operations, transient heating and cooling, differential thermal expansions of canisters and glass, and impact loadings from low probability accidents. Results of case studies that illustrate applicable methods of stress analyses are presented for these sources of stress. Results of a test program to measure the creep strength of candidate canister materials are described. Methods to predict residual stress in the walls of waste canisters are discussed. DOE

74 OPTICS

Includes light phenomena.

N80-19940 Carnegie-Mellon Univ., Pittsburgh, Pa.
INTEGRATED OPTICS FOR RF SPECTRUM ANALYSIS AND ACOUSTIC MICROSCOPY FOR THE STUDY OF MATERIAL JOINTS Ph.D. Thesis
Chin Chung Lee 1979 204 p
Avail: Univ. Microfilms Order No. 8003407

Two topics in the areas of integrated optics and acoustic microscopy are discussed. The first topic investigates a number of novel integrated acoustooptics approaches for real time rf spectrum analysis. The second topic explores the utilization of scanning acoustic microscopy for the study of solid material joints, bonds, and composite. Both studies are carried out theoretically and experimentally. Dissert. Abstr.

N80-19941# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
THEORY OF EDGE DETECTION
D. Marr and E. Hildreth Apr. 1979 64 p refs
(Contract N00014-75-C-0643; Grant NSF MCS-77-07569)
(AD-A078063; AI-M-518) Avail: NTIS HC A04/MF A01 CSCL 20/6

A theory of edge detection is presented. (1) Intensity changes, which occur in a natural image over a wide range of scales, are detected separately at different scales. At a given scale, this is best done by finding the zero-crossings of gradient-squared G(x,y) * (I(x,y) for image I, where G(x,y) is a two-dimensional gaussian distribution, and gradient-squared is the Laplacian. (2) The physical phenomena that give rise to the intensity changes are localized. This allows one to construct rules for combining information from the different scales into a primitive description of the image. A physiological model for zero-crossing detection is proposed. GRA

N80-19942*# Hughes Aircraft Co., Irvine, Calif.
FORECAST ANALYSIS OF OPTICAL WAVEGUIDE BUS PERFORMANCE Final Report, 1 May - 5 Oct. 1979
R. LeDesma and M. D. Rourke Oct. 1979 76 p refs Prepared for JPL
(Contract JPL-955200)
(NASA-CR-162851) Avail: NTIS HC A09/MF A01 CSCL 20F

Elements to be considered in the design of a data bus include: architecture; data rate; modulation, encoding, detection; power distribution requirements; protocol, work structure; bus reliability, maintainability; interterminal transmission medium; cost; and others specific to application. Fiber- optic data bus considerations for a 32 port transmissive star architecture, are discussed in a tutorial format. General optical-waveguide bus concepts, are reviewed. The electrical and optical performance of a 32 port transmissive star bus, and the effects of temperature on the performance of optical-wavaguide buses are examined. A bibliography of pertinent references and the bus receiver test results are included. A.R.H.

N80-19943# Westinghouse Defense and Electronic Systems Center, Baltimore, Md. Systems Development Div.
INTELLIGENT TRACKING TECHNIQUES Quarterly Report, 1 Jan. - 30 Mar. 1979
Thomas J. Willett 30 Mar. 1979 101 p refs
(Contract DAAK70-78-C-0167)
(AD-A077869; QR-2) Avail: NTIS HC A05/MF A01 CSCL 17/5

This is the Second Quarterly Report under a contract to investigate the design, test, and implementation of a set of algorithms to perform intelligent tracking and intelligent target homing on FLIR and TV Imagery. The intelligent tracker will monitor the entire field of view, detect and classify targets, perform multiple target tracking and predict changes in target signature prior to the target's entry into an obscuration. The intelligent tracking and homing system will also perform target prioritization and critical aimpoint selection. The intelligent tracker was defined in terms of its functions and a systems analysis of those functions led to a set of constraints. Analysis of the intelligent tracker embedded in AAH, RPV, PGM scenarios provided additional system requiremnts and goals. The base line frame to frame tracker was described and a number of variations. An effort was devoted to restucture the segmentation algorithms to sharpen their ability to segment small targets (4 lines high) in heavy clutter. Target signature prediction was analyzed in terms of two examples from the NV and EOL TV data base. Also included is a description of the NV and EOL TV data base. GRA

N80-19944# Eikonix Corp., Burlington, Mass.
ANALYTICAL STUDIES OF PHASE ESTIMATION TECHNIQUES, VOLUME 1 Final Technical Report, Sep. 1977 - Nov. 1978
R. Childlaw, A. Devaney, and R. Gonsalves Griffiss AFB, N.Y. RADC Sep. 1979 121 p
(Contract F30602-77-C-0176; ARPA Order 3223)
(AD-A078006; EC/2107401-TR-1-Vol-1; RADC-TR-79-221-Vol-1) Avail: NTIS HC A06/MF A01 CSCL 20/6

The phase retrieval problem consists of the wave aberration function of an optical system from intensity measurements made in the image plane. An adaptive optical system may then be corrected for the aberration to yield improved performance. Several algorithms for performing phase retrieval are discussed and the results of computer simulations are presented. The sensitivity of the algorithms with respect to type and magnitude of aberrations, image plane detector dimensions and noise levels, non-monochromaticity of incident radiation and the structured target objects is investigated. Results demonstrate the practicality of phase retrieval. GRA

N80-19945# Visidyne, Inc., Burlington, Mass.
BACKGROUND OPTICAL SUPPRESSION SYSTEM (BOSS)
O. Shepherd, T. F. Zehnpfennig, Saul Rappaport, and W. P. Reidy Hanscom AFB, Mass. AFGL 10 Oct. 1979 76 p refs
(Contract F19628-79-C-0005; AF Proj. 7670)
(AD-A077871; VI-493; AFGL-TR-79-0243; SR-2) Avail: NTIS HC A05/MF A01 CSCL 20/6

A background optical suppression scheme utilizing a double-beam interferometer-spectrometer with cosligned beams and tailored modulation, transfer functions is presented. The system is designed to enhance the detectability of localized sources in the presence of strong spatially structured background in the IR region of the spectrum. The principles of the double-beam interferometer, several different schemes for tailoring the system MTF, and the results of calculations of the signal-to-noise for a variety of MTFs and types of backgrounds, are discussed. The optical, mechanical and electrical components of the Visidyne laboratory double-beam interferometer are described. The data system and laboratory test source are also discussed. Laboratory measurements demonstrating the spatial and spectral filtering capabilities are presented. GRA

N80-19946# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.

SOME PROPERTIES OF DISCONTINUITIES IN THE IMAGE IRRADIANCE EQUATION

Anna R. Bruss Apr. 1979 43 p refs

(Contract N00014-75-C-0643)

(AD-A078062; AI-M-517) Avail: NTIS HC A03/MF A01 CSCL 20/6

The image irradiance equation is a first-order partial differential equation. Part of this paper is a comprehensive guide to solving this kind of equation. The special structure of the image irradiance equation is explored in order to understand the relation of discontinuities in the surface properties and in the image intensities. GRA

N80-19947# Syracuse Univ., N. Y. Dept. of Electrical and Computer Engineering.

DEFT: ADVANCED STRUCTURES AND APPLICATIONS Final Report, 10 Jun. 1977 - Mar. 1979

Stephen T. Kowel, Phillipp G. Komreich, Amaresh Mahapatra, Dennis Cleverly, and Thomas Szebenyi 30 Jun. 1979 112 p refs

(Contract DAAG53-76-C-0162)

(AD-A075373; TR-79-12) Avail: NTIS HC A06/MF A01 CSCL 17/8

During the period covered by this report, major progress was achieved in several areas, including the CdS sensor, light valve, and applications. The major impetus to this work is the desirability of a real-time, programmable sensor for use in image and signal processing. The basic result from any of these devices is a detected electronic signal current. The 30 MHz CdS/LiNbO3 sensor can now be routinely fabricated as a monolithic structure, using a metallized polymer pedestal for sampling. This permits the device to be incorporated in a camera-like box with a highly convergent commercial lens for use under typical incoherent illumination conditions. Extensive effort has led to the successful operation of both 35 MHz and 100 MHz devices based on our experience with the 30 MHz structure. Beyond the extra care required during the photolithography in order to obtain the three-fold increase in resolution, we had to overcome an excessively large acoustic loss encountered at the higher frequencies. GRA

N80-19948# Morgan Semiconductor, Inc., Garland, Tex.

GE-SI SUPERSONIC FLIR WINDOW Final Report, 1 Jul. 1978 - 31 Mar. 1979

A. R. Hilton Jul. 1979 49 p

(Contract F33615-78-C-5105)

(AD-A078371; AFML-TR-79-4085) Avail: NTIS HC A03/MF A01 CSCL 17/5

The purpose of the program was to evaluate the infrared optical properties and related physical properties of melt formed Germanium-Silicon alloys as potential supersonic FLIR window materials. The approach was to combine the infrared transparency of germanium with the excellent physical properties of silicon to produce a window material capable of withstanding the temperature excursions and rain drop impact occuring during supersonic flight. Attention was confined to alloys with silicon content below 50 atom % to avoid the intrinsic lattice absorption that occurs at 9 micrometers in the infrared for silicon or silicon rich alloys. A zone levelling technique was selected and modified in a manner expected to yield materials free of oxide absorption. A melt form method was selected rather than vapor phase because of the potential problems in scaling up to produce large FLIR windows. Unfortunately, the growth of alloy compositions with silicon content above 5% proved to be impossible to do at least under the operating conditions and with the equipment used. Major problems were long term temperature stability, zoning rates and reactivity of the molten alloys with quartz boats and ampoules. Although the concentration range up to 50 atom % silicon was covered, infrared transmission was not obtained for any compositions with silicon content above 5 atom%. Rain erosion samples were submitted for evaluation covering five compositions. Discussions related to the best Ge-Si alloy composition for FLIR applications are presented along with a projection of the related physical-optical parameters expected for that composition. GRA

N80-19949# Cincinnati Univ., Ohio. Solid state Electronics Lab.

OPTICAL CHANNEL WAVEGUIDE ARRAYS COUPLED TO INTEGRATED CHARGE-COUPLED DEVICES AND THEIR APPLICATIONS Interim Report

J. T. Boyd and C. A. Ramey 1979 25 p refs

(Grants AF-AFOSR-3032-76; NSF ENG-76-17145; AF Proj. 2305)

(AD-A077394; AFOSR-79-1124TR) Avail: NTIS HC A02/MF A01 CSCL 17/8

Device configurations of optical channel waveguide arrays coupled to integrated charge-coupled devices (CCDs) will be presented. Optical and electrical performance of these devices will be discussed. A channel waveguide array formed in a fan-out pattern is then introduced as a means of enhancing optical waveguide focal plane resolution in integrated optical devices utilizing optical waveguide lenses. High spatial resolution can thus be obtained without making detector spacings too small, thus avoiding detector problems with regard to fabrication, cross talk linearity and charge transfer efficiency. To fabricate the fan-out channel waveguide array, a new differential heating and photoresist lift-off process is discussed which allows high resolution patterns to be reproducibly formed in polyurethane. Propagation of light from a HeNe laser in these fan-out channel waveguide arrays has been demonstrated with only a small amount of scattering. Low scattering is consistent with the smooth channel waveguide surfaces apparent in scanning electron microscope pictures presented. Applications of optical channel waveguide arrays coupled to integrated CCDs to fiber multiplexing and transversal filtering will also be discussed. GRA

N80-19950# University of Central Florida, Orlando. Dept. of Mathematics and Statistics.

SOME MODELS FOR VISIBILITY Technical Report, 1 Sep. 1978 - 30 Jun. 1979

Paul N. Somerville, Steven J. Bean, and Sherrill Falls Jun. 1979 44 p refs

(Contract F19628-77-C-0080; AF Proj. 6670)

(AD-A075490; AFGL-TR-79-0144; SK-3) Avail: NTIS HC A03/MF A01 CSCL 04/2

Models for predicting the climatological probability of visibility less than a given number of miles at a given time and for twenty-two diverse locations are developed. The two parameter Weibull distribution is used. The first models require the two parameter values for each month and three hour periods of the day (96 sets of two parameters) for each station. The second models are general models, and for each station the two parameters are polynomial functions of the month and time of day. Estimates of the amount of error to be expected when using the models are given. GRA

N80-19951# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

DISPLAY WORKING GROUP JOINT DARCOM/NMC/AFLC/AFSC PANEL ON THE FIELD OF NIGHT VISION TECHNOLOGY Interim Summary Report

William N. Kama, Wayne L. Martin, and Gilbert G. Kuperman Oct. 1979 371 p refs Workshop held in San Diego, Calif., 16-18 Jan. 1979

(AF Proj. 7184)

(AD-A077061; AMRL-TR-79-101) Avail: NTIS HC A16/MF A01 CSCL 17/5

The purpose of this workshop was to define the doctrinal

and system requirements driving advanced display technology for next generation FLIR applications. To achieve this purpose, seven sessions were conducted. Four were tutorial in nature and three were discussion forums. The tutorial sessions (Sessions 1, 2, 3, and 6) covered the topics of mission/doctrine requirements, system requirements, human factors and sensor/display state-of-the-art. The discussion sessions (Sessions 4, 5, and 7) provided the attendees with the opportunity to interact with one another as well as to enter into informative and effective dialogue. Session 4 served as a 'question and answer' period for topics covered in the first three sessions; Session 5 covered the topic of defining common terms used within the sensor/display community and developing standardized image measurement techniques; while Session 7 served as a summary session whereby attendees attempted to summarize what had transpired at the Workshop. This report documents, in a concise and coherent manner, the proceedings that occurred during the conduct of this workshop. A summary of each session is provided along with summary papers and associated presentation materials submitted by participants. GRA

N80-19952# Drexel Univ., Philadelphia, Pa. Dept. of Physics and Atmospheric Sciences.
DEVELOPMENT OF QUASI-HOMOGENEOUS OPTICAL SOURCES Final Report, 1 Jan. - 31 Dec. 1978
Lorenzo M. Narducci 1 Nov. 1979 37 p refs
(Grant DAAG29-78-G-0098)
(AD-A079297; ARO-16054.2-A-P) Avail: NTIS HC A03/MF A01 CSCL 20/6

This report summarizes our theoretical and experimental findings. It is divided into 4 sections. Section 1 contains a general introduction to the problem of partially coherernt sources. Section 2 summarizes the main known results on Schell model and quasi-homogeneous sources. Section 3 contains a description of the experimental set up and of the accuracy of the instrumentation. Section 4 is a preprint of a recently submitted paper unauthored jointly with Dr. E. Collett and detailing the main experimental results obtained under ARO support. GRA

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N80-19953# Nagoya Univ. (Japan).
[CONFINEMENT AND HEATING OF HOT PLASMAS IN A HYBRID SYSTEM OF TOKAMAK AND STELLARATOR] Annual Review, Apr. 1978 - Mar. 1979
1979 211 p refs
(ISSN-0547-1567) Avail: NTIS HC A10/MF A01

Activities reported relate to J.I.P.P. T-2 experiments; high beta pinch plasmas; radio frequency containment; high energy beam experiments; the Nagoya bumpy torus; laser-produced plasmas; basic experiments in plasma physics; atomic processes; technology and applied plasma physics; and plasma theory and computations. Additional information is provided on the computer center, the research information center, and common facilities including the technical services division, and the 125 MVA flywheel power supply facility. A list publications from April '78 to March '79 is included. A.R.H.

N80-19954*# Stanford Univ., Calif.
LANGMUIR PROBE MEASUREMENTS OF DOUBLE-LAYERS IN A PULSED DISCHARGE
J. S. Levine and F. W. Crawford Mar. 1980 48 p refs
(Grants NGL-05-020-176; NSF ATM-78-08440)
(NASA-CR-162845; SU-IPR-807) Avail: NTIS HC A03/MF A01 CSCL 20I

Langmuir probe measurements were carried out which confirm the occurrence of double-layers in an argon positive column. Pulsing the discharge current permitted probe measurements to be performed in the presence of the double-layer. Supplementary evidence, obtained from DC and pulsed discharges, indicated that the double-layers formed in the two modes of operation were similar. The double-layers observed were weak and stable, their relation to other classes of double-layers are discussed, and directions for future work are suggested. Author

N80-19955# Indiana Univ. at Bloomington. Dept. of Chemistry.
CHARACTERISTICS OF THE BACKGROUND EMISSION SPECTRUM FROM A MINIATURE ICP Ph.D. Thesis. Interim Report
R. N. Savage and G. M. Hieftje 26 Nov. 1979 22 p refs Submitted for publication
(Contract N00014-76-C-0838; Grants NSF CHE-76-10896; NSF CHE-77-22152)
(AD-A077876; TR-22; TR-28) Avail: NTIS HC A02/MF A01 CSCL 20/9

The spectral characteristics of the background radiation emitted by a miniature inductively coupled plasma are carefully examined and methods for reducing undesirable features discussed. Also investigated are the influences that several important experimental parameters, such as coolant tube length, RF power and coolant and nebulizer gas flow rates have on plasma background emission. The complex nature of the mini-ICP's background emission spectrum indicates that careful line selection criteria and background correction procedures be employed. Extending a torch's coolant tube to the bottom of the region being observed in the plasma proved to be the most effective method for reducing inexpedient spectral features. Acute changes in background emission levels with RF power and nebulizer gas flow rates indicate the need for careful control of these parameters to achieve high precision. Importantly, a comparison between mini-ICP and conventional ICP spectra reveals the basic similarity of the two sources. GRA

N80-19956# Naval Research Lab., Washington, D. C. Plasma Theory Branch.
A THEORY OF ANOMALOUS ABSORPTION, BACKSCATTER AND FLUX LIMITATION IN LASER PRODUCED PLASMAS Interim Report
D. G. Colombant and W. M. Manheimer 11 Oct. 1979 68 p refs
(NRL Proj. 67H02-58a)
(AD-A075350; NRL-MR-4083) Avail: NTIS HC A04/MF A01 CSCL 20/9

Fluid simulations of laser light absorption and backscatter are presented for various laser irradiances, wavelengths, target materials, laser pulse lengths and simulated prepulse conditions. Physical processes included in the model are inverse bremsstrahlung, resonant absorption, absorption by ion-acoustic fluctuations, and Brillouin backscatter. For the anomalous processes, self-consistent transport coefficients are derived and used throughout the time-dependent, one-dimensional code. Flux limitation is thus taken into account as a result of the physical processes included. Interplay between the various absorption mechanisms and backscatter are uncovered in this study. Comparisons with experiments are presented and suggestions for further experiments are made. GRA

N80-19957# Naval Research Lab., Washington, D. C. Plasma Physics Div.
THEORY OF ELECTRON CYCLOTRON RESONANCE HEATING OF TOKAMAK PLASMAS
Edward Ott, Bertram Hui, and K. R. Chu 19 Sep. 1979 70 p refs Sponsored by DOE
(AD-A075362; NRL-MR-4028) Avail: NTIS HC A04/MF A01 CSCL 18/1

A theoretical study of Tokamak plasma heating by the electron cyclotron resonance is presented. The density limitations imposed by accessibility are first reviewed. Then the predictions of linear theory (including relativistic effects on the wave absorption) are examined via solution of the ray equations in a toroidal Tokamak equilibrium. These solutions indicate quite favorable characteristics for large Tokamaks. Finally, the possibilities of scattering of the incident heating wave by existing drift-wave-type fluctuations and of parametric instability are examined; it is tentatively concluded that parametric instabilities and wave scattering should not be important in typical situations of interest. GRA

N80-19958*# Naval Research Lab., Washington, D. C. Upper Air Physics Branch.

MAGNETOSHEATH EFFECTS ON CYLINDRICAL LANGMUIR PROBES
Edward P. Szuszczewicz and Peter Z. Takacs 23 Oct. 1979 21 p refs Revised
(NASA Order W-14252)
(NASA-CR-162852; AD-A077043; NRL-MR-3683-Rev) Avail: NTIS HC A02/MF A01 CSCL 20/9

The response of cylindrical Langmuir probes in magnetoplasmas is studied from a perspective which focuses on the relative magnitudes of Larmor radius and sheath size. The approach results in a classification for magnetic field effects which involves not only the magnetic field strength but also the plasma parameters of density, temperature, and the applied probe potential. We specifically show that a 0.25 G field can have similar effects on the current collection properties of the probe in an ionospheric plasma N sub e approx. = 1,000,000/cu cm. as a 30 kG field would have in a hot, dense laboratory plasma N sub e approximately = 10 to the 15th power/cu. cm. The classifications are found to agree with new experimental results collected in an ionospheric plasma. The data also show: the effects of probe orientation on electron current collection from magnetoplasmas; that these effects can be important even when the electron Larmor radius is larger than the radius of the probe; and that substantial magnetic field effects occur when the probe's sheath is comparable to or greater than the Larmor radius. GRA

N80-19959# California Univ., Livermore. Lawrence Livermore Lab.
MAGNETIC MIRROR CONFINEMENT OF HIGH-ENERGY, HIGH-DENSITY PLASMA
F. H. Coensgen and T. C. Simonen 21 Aug. 1979 18 p refs
(Contract W-7405-eng-48)
(UCRL-82790) Avail: NTIS HC A02/MF A01

The confinement in single-cell magnetic mirror systems of plasmas close to thermonuclear conditions is discussed. The injection of low energy plasma is shown to suppress microinstabilities to sufficiently low levels that high-beta (beta approximately = 1) plasmas can be achieved and sustained by cross field injection of beams of neutral particles. Plasma confinement is found to improve with ion energy, electron temperature, and plasma size. Design parameters of a large mirror fusion test facility, designed to pursue confinement scaling to higher energies and larger plasma dimensions, are briefly reviewed. DOE

N80-19960# Los Alamos Scientific Lab., N. Mex.
NORMAL IONIZING SHOCK AS A THETA PINCH PREIONIZER
A. DeSilva Oct. 1979 21 p refs
(Contract W-7405-eng-36)
(LA-8064-MS) Avail: NTIS HC A02/MF A01

The normal ionizing shock wave is considered as a potential preionizer for high density, high bias field theta pinches. Available experimental data is compared with the theory of Kunkel and Gross which was written for plane geometry. Limitations to the validity of the theory due to finite ionization rate, and to radial plasma drift are determined. DOE

N80-19961# California Univ., Livermore. Lawrence Livermore Lab.
CONSEQUENCES OF INTENSITY CONSTRAINTS ON INERTIAL CONFINEMENT FUSION
R. E. Kidder 13 Sep. 1979 18 p refs Presented at 5th Workshop on Laser Interaction, Rochester, N.Y., 5 Nov. 1979
(Contract W-7405-eng-48)
(UCRL-83342; CONF-791109-1) Avail: NTIS HC A02/MF A01

It is shown that the conflicting requirements of high implosion efficiency (low corona temperature) and adequate energy transport (high corona temperature) can, together with other effects, limit useful infrared light intensities to values on the order of 100 Tw/sq cm. Increased interest in ultraviolet lasers, and the entry of charged particle drivers in the inertial confinement fusion (ICF) competition are consequences of this limitation. Analytical results based on a simple model are presented which show how the gain of an ICF target is modified by the existence of an arbitrary intensity constraint. DOE

N80-19962# California Univ., Berkeley. Lawrence Berkeley Lab.
NONLINEAR WAVE EVOLUTION IN VLASOV PLASMA: A LIE-TRANSFORM ANALYSIS
John Robert Cary Aug. 1979 298 p refs
(Contract W-7405-eng-48)
(LBL-8185) Avail: NTIS HC A13/MF A01

Nonlinear wave evolution on Vlasov plasma is analyzed using the Lie transform, a mathematical tool which is applicable to Hamiltonian systems. Dewar's general Lie transform theory is explained and is used to construct Deprit's Lie transform perturbation technique. The basic theory is illustrated by simple examples. DOE

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers*.

N80-19963 Cornell Univ., Ithaca, N. Y.
INVESTIGATION OF HIGHER ORDER FORBIDDEN REFLECTIONS IN Si AND Ge USING SYNCHROTRON RADIATION Ph.D. Thesis
Dennis Martin Mills 1979 248 p
Avail: Univ. Microfilms Order No. 8003962

Exploiting the unique properties of synchrotron radiation produced at the 12 GeV Wilson synchrotron, the forbidden (442) and (622) reflections in silicon and germanium were detected and measured. The reflections, whose integrated intensities are 5 to 6 orders of magnitude smaller than allowed reflections, arise in diamond structure materials from two distinct effects: the antisymmetric charge distribution due to directional bonding and the anharmonic thermal motion of the nucleus. The antisymmetric scattering amplitudes obtained along with the Si (222) were compared to predicted values derived from the measured and calculated scattering amplitudes of allowed reflections in silicon and with values determined from band structure calculations. The degree of agreement depended on the calculational method used. General experimental techniques for use at synchrotron radiation sources and the particular merits of using synchrotron radiation for the measurement of extremely weak forbidden reflections are discussed. Dissert. Abstr.

N80-19964 Illinois Univ. at Urbana-Champaign.
PHOTODESORPTION OF GASES FROM METAL AND SEMICONDUCTOR SURFACES Ph.D. Thesis
Robert David Moore 1979 177 p
Avail: Univ. Microfilms Order No. 8004234

Molecular photodesorption from metal and semiconductor surfaces was investigated. The techniques employed to obtain adequate sensitivity made use of a chopped light beam and synchronous particle counting by means of a mass spectrometer. Definitive measurements of the photodesorption efficiencies of several molecular species (Co2, CO, H2, and CH4) from a number of metals and semiconductors are presented. Dissert. Abstr.

N80-19965 Illinois Univ. at Urbana-Champaign.
CRYSTAL GROWTH AND PHASE STABILITY OF METASTABLE INDIUM ANTIMONIDE BISMIDE THIN FILMS Ph.D. Thesis
John Leon Zilko 1979 103 p
Avail: Univ. Microfilms Order No. 8004315

Single crystal metastable indium antimonide bismide thin films were grown on (110) GaAs substrates by multitarget sputtering (MTS). The solid solubility of InBi in InSb was increased from 2.6 mole percent found in equilibrium alloys to 12 mole percent for MTS deposited metastable alloys. Films were grown on a rotating substrate from stationary InSb and Bi sputtering targets such that one monolayer or less of material impinged on the substrate per target pass. The Group 5 in flux ratio was greater than, or equal to one. The elemental incorporation probabilities of In, Sb, and Bi during growth consisted of two terms, a thermal sticking probability term, and a term accounting for resputtering. Dissert. Abstr.

N80-19966# Princeton Univ., N. J. Joseph Henry Labs. of Physics.
WHY DO GLASSY MATERIALS POSSESS ENERGY GAPS
D. C. Licciardello Dec. 1979 14 p refs Prepared in cooperation with Bell Telephone Labs., Murray Hill, N.Y.
(Contract N00014-77-C-0711; Grant NSF DMR-78-03015)
(AD-A078668) Avail: NTIS HC A02/MF A01 CSCL 07/4

We discuss the nature of transparency in glassy materials. The accepted view provides for energy gaps due to the persistence (into the glassy state) of structure in the electronic spectrum. An alternative mechanism, discussed here, follows from inclusion of a strong electron phonon interaction for localized electronic state. We examine the consequences of varying the strength of the interaction for a simple model, and predict a qualitatively different behavior for strong and weak coupling. GRA

N80-19967# Hewlett-Packard Co., Palo Alto, Calif. Solid State Lab.
VPE GROWTH OF (Al, Ga)As Final Technical Report, 15 Aug. 1977 - 15 Feb. 1979
Gerald B. Stringfellow Oct. 1979 133 p refs
(Contract F19628-77-C-0199; AF Proj. 2306)
(AD-A078264; RADC-TR-79-207) Avail: NTIS HC A07/MF A01 CSCL 20/12

The organometallic vapor phase epitaxial (OMVPE) growth process was utilized for the growth of Alx Ga1-x As alloys in both hot wall and cold wall reactor systems. Growth parameters including substrate temperature, V/III ratio, flow ratio, etc. were studied together with their influence on the electrical transport and luminescent properties of the epitaxial layers. Both p-type (Zn) and n-type (Te) dopants were used to achieve the desired doping profiles. Carbon and oxygen were found to be significant contaminants in these layers and two approaches to minimizing their concentration were studied. In the hot wall system HCl was added to the gas stream; in the cold wall system the use of graphite baffles was found to reduce the concentration of non-radiative centers. The photoluminescence efficiency of layers grown under optimized conditions were found to be comparable to that of LPE layers. Deep level transient spectroscopy (DLTS) measurements revealed two characteristic levels at approximately 0.41 eV and 0.49 eV respectively, with a weak dependence on compositions. Double heterostructure lasers were successfully fabricated from these layers and exhibited threshold current densities within a factor of 2 of layers of the same geometry using LPE material. GRA

N80-19968# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
CHARACTERIZATION OF LPE GROWN HgCdTe BY ION SCATTERING SPECTROMETRY Final Report, Jul. 1978 - Jul. 1979
William L. Baun Sep. 1979 29 p refs
(AF Proj. 2303)
(AD-A077884; AFML-TR-79-4124) Avail: NTIS HC A03/MF A01 CSCL 20/12

Results are shown here for low energy ion scattering spectrometry (ISS) experiments on mercury cadmium telluride (HCT) grown by liquid phase epitaxy (LPE) on CdTe substrates. By proper etching of the substrates and control of epitaxial growth conditions, surfaces of the zinc blend structure may be obtained in which 111 faces have a top layer of cadmium and mercury (A sites) or of tellurium (B sites). Ion scattering experiments at low energies (500 V or less) on epitaxial HCT show only A or B sites. However, when the helium or neon ion beam potential is raised to values conventionally used (1500-2500 V), then energy losses from both A and B atoms are observed. At these higher energies the ions sputter or displace the outer atoms or tunnel through to interact with atoms in the second layer. Spectra obtained at these higher energies show interesting fine structure which suggest that energy losses are occurring in multiple collisions and nonbinary scattering. Scattered ion yield curves, which for some elements, show oscillatory fine structure, are dramatically different for A and B surfaces. Even though these yield curves are very complicated because of the structure and number of elements, the fine structure may prove useful for further understanding of interaction of neighboring atoms. Yield curves along with low energy ion scattering spectra provide a unique method of analysis of the outermost atomic layer of epitaxial films. GRA

N80-19969# Stanford Univ., Calif. Electronics Labs.
STUDY OF THE ELECTRONIC SURFACE STATE OF 3-5 COMPOUNDS Final Report
W. E. Spicer 15 Oct. 1978 259 p refs
(Contract DAAK02-74-C-0069; DARPA Order 2182)
(AD-A076304) Avail: NTIS HC A12/MF A01 CSCL 09/1

In the past few years, we have made intensive studies of the physics of compound semiconductor interfaces. This report contains the most important results obtained during the contact period and is divided roughly into three parts dealing with Schottky-barrier formation, oxygen chemisorption, and cesium and cesium oxide overlayers. Following the overview, chapter 2 presents a model for the surface structure of GaAs which in now accepted. The next chapter demonstrates that Schottky-barrier pinning is due not to intrinsic surface states but to metal induced extrinsic states. Chapter 4 describes synchrotron radiation studies of Au Schottky-barrier formation on the IV-V semiconductors and presents a model of Schottky-barrier pinning based on defect formation induced by the Au overlayer. GRA

N80-19970# Lincoln Lab., Mass. Inst. of Tech., Lexington.
MAGNETIC MOMENT VERSUS TEMPERATURE CURVES OF RARE-EARTH IRON GARNETS
Gerald F. Dionne Jul. 1979 22 p refs
(Contract F19628-78-C-0002; DA Proj. 8X3-63304-D-215)
(AD-A077356; TR-534; ESD-TR-79-179) Avail: NTIS HC A02/MF A01 CSCL 11/6

Molecular-field coefficients of the heavy rare-earth iron garnets (Tb, Dy, Ho, Er, Tm, and Yb)IG) have been determined by fitting calculated and experimental magnetic-moment-vs-temperature curves. For these compositions, spin canting appears to cause a significant reduction in the net moment of the c sublattice. The results are compared with values of coefficients derived from paramagnetic susceptibility measurements and with other values determined without taking into account c sublattice canting. The capability of the computer program has been expended to permit magnetization-temperature calculations of compositions that contain as many as three different rare earth ions in the c sublattice. GRA

N80-19971# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
DETERMINATION OF MORPHOLOGY AND ELECTRONIC STRUCTURE IN SOLIDS WITH 20-1000 eV RADIATION Ph.D. Thesis
D. R. Denley Aug. 1979 174 p refs
(Contract W-7405-eng-48)
(LBL-9482) Avail: NTIS HC A08/MF A01

The techniques of absorption and photoemission are described using experiments on a variety of materials to analyze their morphology and electronic structure. The principles underlying the techniques of soft X-ray absorption and bulk and surface photoemission are discussed together with some of the experimental methods and instrumentation. A.W.H.

N80-19972# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
DETERMINATIONS OF ELECTRONIC STATES IN CRYSTALLINE SEMICONDUCTORS AND METALS BY ANGLE-RESOLVED PHOTOEMISSION Ph.D. Thesis
K. A. Mills Aug. 1979 152 p refs
(Contract W-7405-eng-48)
(LBL-9429) Avail: NTIS HC A08/MF A01

An important part of the theoretical description of the solid state is band structure, which relies on the existence of dispersion relations connecting the electronic energy and wavevector in materials with translational symmetry. These relations determine the electronic behavior of such materials. The elaboration of accurate band structures, therefore, is of considerable fundamental and practical importance. Angle-resolved photoemission (ARP) spectroscopy provides the only presently available method for the detailed experimental investigation of band structures. Its application to both semiconducting and metallic single crystals

is considered with emphasis on gallium arsenides, germanium gallium arsenides, gold, silver, and platinum. DOE

N80-19973# Argonne National Lab., Ill.
MOESSBAUER EFFECT INVESTIGATIONS OF THE ELECTRONIC AND MAGNETIC PROPERTIES OF RARE EARTH METALS AND INTERMETALLIC HYDRIDES
B. D. Dunlap, G. K. Shenoy, J. M. Friedt, P. J. Viccaro, D. Niarchos, H. Kierstead, A. T. Aldred, and D. G. Westlake 1979 17 p refs Presented at the INTERMAG-MMM Conf., New York, N. Y., 17 Jul. 1979
(Contract W-31-109-eng-38)
(CONF-790738-4) Avail: NTIS HC A02/MF A01

Moessbauer spectroscopy was used in a number of investigations of elemental rare earth (RE) metal and RE - transition metal intermetallic hydrides. Analysis of hyperfine parameters established the crystalline electric field (CEF) ground state for Dy(+) in DyH2 and for Er(3+) in ErH2 and YH2. In all cases the results are compatible with the presence of negatively charged hydrogen atoms. Long range magnetic ordering is observed in the RE-H2 compounds. In DyH2, short-range magnetic ordering is seen at temperatures up to twice the long-range transition temperature. As an example of an intermetallic hydride, the cubic Laves phase RE-iron compounds were studied. These form several stable hydride phases RE-Fe2H/sub x/2, with the maximum x being in excess of 4. The magnetic transition temperatures decrease to roughly half their original values for x = 3.5, and the RE-Fe exchange interaction is weakened. DOE

N80-19974# Northwestern Univ., Evanston, Ill. Dept. of Chemical Engineering.
SOLID STATE, SURFACE AND CATALYTIC PROPERTIES OF OXIDES Progress Report, 1 Aug. 1978 - 30 Sep. 1979
H. H. Kung Sep. 1979 11 p refs
(Contract ER-78-S-02-4987)
(COO-4987-1) Avail: NTIS HC A02/MF A01

The catalytic oxidative dehydrogenation of butene on iron containing oxides was studied in the hope of understanding the interrelationship among the bulk, the surface, and the catalytic properties of oxides. Emphasis was on the elucidation of the factors that determine the difference in selectivity for butadiene versus carbon dioxide on iron oxide and on zinc iron oxide, and on the determination of surface cation ratio in a solid solution of two binary oxides. It is found that the oxidation of butene to butadiene and to carbon dioxide takes place on two separate sites. The results show that zinc iron oxide is a more selective oxidation catalyst than iron oxide because it has a higher density of selective oxidation sites and a lower density of combustion sites, and because its combustion sites are less active than those on iron oxide. DOE

N80-19975# National Technical Information Service, Springfield, Va.
JOSEPHSON JUNCTIONS. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Aug. 1978
George W. Reimherr Dec. 1979 237 p Supersedes NTIS/PS-78/1047; NTIS/PS-77/0841; NTIS/PS-76/0744 and NTIS/PS-75/590 2 Vol.
(PB80-802655; NTIS/PS-78/1047; NTIS/PS-77/0841; NTIS/PS-76/0744; NTIS/PS-75/590) Avail: NTIS HC $30.00/MF $30.00 CSCL 20L

The cited reports of Federally funded research discuss the theory, design, fabrication, performance, and applications of Josephson junctions. References to such applications as far infrared radiation detectors, microwave detectors, voltage standards, noise thermometry, and magnetometry are included. This updated bibliography contains 237 abstracts, 38 of which are new entries to the previous edition. GRA

N80-19976# National Technical Information Service, Springfield, Va.
JOSEPHSON JUNCTIONS, VOLUME 2. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1975 - Aug. 1978
George W. Reimherr Dec. 1979 295 p 2 Vol.
(PB80-802663) Avail: NTIS HC $30.00/MF $30.00 CSCL 20L

The cited reports of worldwide research discuss theory, design, fabrication, performance, and applications of Josephson junctions. References to such applications as logic circuits, shift registers, data storage devices, far infrared detectors, microwave detectors, voltage standards, noise thermometry, and magnetometry are included. This updated bibliography contains 295 abstracts, none of which are new entries to the previous edition. GRA

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer*.

N80-19977# Texas Univ., Austin. Center for Particle Theory.
REINTRODUCING THE CONCEPT OF FORCE INTO RELATIVITY THEORY
S. Mahajan, Asghar Qadir, and Prashant Valanju Jul. 1979 37 p refs
(Contract EY-76-S-05-3992)
(ORO-3992-367) Avail: NTIS HC A03/MF A01

Reintroducing forces into the relativity theory is examined. The Kerr-Newmann geometry, and special cases of it, indicate that there is a short range repulsion in general. This repulsion suggests that naked singularities are physically feasible. It is also found that there is a gravito-electric repulsion which is important to consider in a grand unification scheme of strong, weak, and electromagnetic forces. DOE

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N80-19978 Wisconsin Univ. - Madison.
STRUCTURES IN AERONAUTICAL PHRASEOLOGY: FROM ENGLISH TO SPANISH Ph.D. Thesis
Francisco Xavier Almeida 1978 425 p
Avail: Univ. Microfilms Order No. 7915065

The creation of an English Phraseology, its adoption as the International Language for Aviation, and the establishment of the official ICAO (International Civil Aviation Organization) Spanish Phraseology are traced. The regulations and structures governing civil aviation are surveyed and some of the more important studies on the formulation of the Phraseology and on its applications to actual flight conditions are examined. An unexpected result of the investigation is that aeronautical radio can be a fertile ground in which to observe without interfering with the observation, the phenomena of dialects in contact, and the modification of certain dialects as a result of sociolinguistic pressures. Some confirmation is provided for a stratification scheme for Spanish dialects which reflects a popularly held view of many native speakers of Spanish. Dissert. Abstr.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N80-19979# Desmatics, Inc., State College, Pa.
AN APPROACH FOR PROVIDING MORE ACCURATE PROBABILITY ASSESSMENTS
Dennis E. Smith and Robert L. Gardner May 1978 104 p refs
(Contract DAHC19-76-C-0045; DA Proj. 2Q7-61102-B-74F)
(AD-A077994; ARI-TR-78-B7) Avail: NTIS HC A06/MF A01 CSCL 12/1

This report describes a possible approach for providing more

accurate probability assessments in those real-world decision-making situations for which relative frequency information generally does not exist. In this approach an estimated functional relationship is obtained from a comparison, in relative frequency base (RFB) problems, of a person's posterior probability assessments with the true posterior probabilities. Then, the functional relationship is used as a model to provide probability predictions for new problems by adjusting the person's corresponding probability assessments. Experimental evidence indicates that the resulting models can provide satisfactory probability predictions for problems having identical structure to those used in model construction. At this time, some obstacles prevent immediate use of these models for probability prediction in non-relative frequency base (NRFB) problems. However, it would be unwise to discount the feasibility of developing a practical RFB-based model for adjusting real-world probability estimates until the approach were tested with participants and problems in a field of common expertise (such as intelligence analysis or weather forecasting, for example) where more uniformity of background and experience exists. GRA

N80-19980# Naval Postgraduate School, Monterey, Calif.
GROUP DECISION MAKING WITH FEEDBACK M.S. Thesis
Amnon Tamir (Israeli Air Force) Sep. 1979 120 p refs
(AD-A078159) Avail: NTIS HC A06/MF A01 CSCL 05/10

A computer tool is developed for the purpose of eliciting group utilities for multiple attributes of one complex system relative to a base line. The procedure accommodates multiple users simultaneously providing anonymous feedback to each user to aid in the process of assessing utilities. The procedure provides complete visibility to a manager (umpire) of changes to the data base, so that the process can be monitored in real time. The software is written so that it is completely self-documented and user friendly. GRA

N80-19981# Naval Postgraduate School, Monterey, Calif.
COMPETITION IN THE ACQUISTION OF MAJOR WEAPONS SYSTEMS M.S. Thesis
Benjamin Russell Sellers Sep. 1979 128 p refs
(AD-A078268) Avail: NTIS HC A07/MF A01 CSCL 05/1

The objectives of this research are: (1) to examine the desirability of competition as expressed by current leaders in the field of major systems acquisition in DOD, in Congress, and in private industry; (2) to evaluate the adequacy of the guidance provided by the current acquisition instructions concerning the need, and the methods available, for generating competition in the acquisition of major weapon systems; and (3) to provide recommendations for improving the guidance contained in the instructions, including the development of a model to aid in making decisions regarding production competition. The results of this research indicate that competition is highly desirable, but that the subject is not adequately addressed in the current instructions. The major contribution of the study is the development of a production competition decision-making model which is presented in Chapter V. This chapter presents the benefits and various methods of obtaining a second production source. Also included is a discussion of the factors which influence the second sourcing decision and a model for determining which of the second sourcing methods, if any, is best suited for any particular acquisition program. It is written as a stand-alone chapter for use as a desk-guide by program managers and/or contracting officers who are faced with making decisions regarding production competition. GRA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N80-19982*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE SPACE SCIENCE DATA SERVICE: A STUDY OF ITS EFFICIENCIES AND COSTS
James I. Vette, Robert H. Hilberg, Donald E. Zuhl, and Albert E. West Dec. 1979 56 p refs
(NASA-TM-80760; NSSDC-79-09) Avail: NTIS HC A04/MF A01 CSCL 05B

Factors affecting the overall advantages and disadvantages of a centralized facility for both the data base and processing capability for NASA's Office of Space Science programs are examined in an effort to determine the best approach to data management in the light of the increasing number of data bits collected annually. Selected issues considered relate to software and storage savings, security precautions, and the phase-in plan. Information on the current mode of processing and on the potential impact of changes resulting from a conversion to a space science data base service was obtained from five user groups and is presented as an aid in determining the dollar benefits and advantages of a centralized system. A.R.H.

N80-19983*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE LEVELS OF EDIT, SECOND EDITION
Robert VanBuren and Mary Fran Buehler Jan. 1980 32 p refs
(Contract NAS7-100)
(NASA-CR-162880; JPL-Pub-80-1) Avail: NTIS HC A03/MF A01 CSCL 05B

The editorial process is analyzed, and five levels of edit are identified. These levels represent cumulative combinations of nine types of edit: Coordination, Policy, Integrity, Screening, Copy Clarification, Format, Mechanical Style, Language, and Substantive. The levels and types of edit, although developed for specific use with external reports at the Jet Propulsion Laboratory, cover the general range of technical editing, especially as it applies to an in-house technical publications organization. Each type of edit is set forth in terms of groups of actions to be performed by editor. The edit-level concept has enhanced understanding and communication among editors, authors, and publications managers concerning the specific editorial work to be done on each manuscript. It has also proved useful as a management tool for estimating and monitoring cost. Author

N80-19984# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.
SERIALIZABILITY OF CONCURRENT DATABASE UPDATES
Christos H. Papadimitriou Mar. 1979 64 p refs
(Contract N00014-75-C-0661; Grants NSF MCS-77-01193; NSF MCS-77-05314)
(AD-A078414; MIT/LCS/TR-210) Avail: NTIS HC A04/MF A01 CSCL 05/2

A sequence of interleaved user transactions in a database system may not be serializable, i.e., equivalent to some sequential execution of the individual transactions. Using a simple transaction model we show that recognizing the transaction histories which are serializable is an NP-complete problem. We therefore introduce several efficiently recognizable subclasses of the class of serializable histories; most of these subclasses correspond to serializability principles existing in the literature and used in practice. We also propose two new principles which subsume all previously known ones. We give necessary and sufficient conditions for a class of histories to be the output of an efficient history scheduler; these conditions imply that there can be no efficient scheduler that outputs all of serializable histories, and also that all subclasses of serializable histories studied above have an efficient scheduler. Finally, we show how our results can be extended to far more general transaction models, to transactions with partly interpreted functions, and to distributed database systems. GRA

N80-19985# Gaertner (W. W.) Research, Inc., Stamford, Conn.
PROGRAMMING SUPPORT LIBRARY. VOLUME 1: FUNCTIONAL REQUIREMENTS Final Report
Carolyn M. Turcio, William M. Schreyer, Norman A. Adams, and Wolfgang W. Gaertner Oct. 1979 41 p
(Contract F30602-78-C-0103; AF Proj. 2531)
(AD-A078438; RADC-TR-79-241-VOL-1) Avail: NTIS HC A03/MF A01 CSCL 05/2

This report, Volume 1, contains the generic functional requirements for a programming support library. The requirements are presented at two levels of detail. Chapter 2 contains a brief summary of the requirements separated into Basic and Full PSL requirements. Chapter 3 contains the full wording of the requirements organized into nine categories. The specification for each individual requirement is followed by a brief description of its purpose. This volume may be used as the specification for a Full or Basic PSL under a software development contract. Volume 2 will be published at a later date. GRA

N80-19986# Harvard Univ., Cambridge, Mass. Div. of Applied Sciences.
ON OPTIMIZATION OF QUERY PROCESSING STRATEGIES Interim Report
D. M. Chiu, Y. C. Ho, and P. A. Bernstein Oct. 1979 59 p refs
(Contract N00014-75-C-0648; Grant NSF ENG-78-15231)
(AD-A078470; TR-672) Avail: NTIS HC A04/MF A01 CSCL 05/2

This report examines the formulation of the query processing problem as an optimization problem. The real problem, which involves database states as parameters, is an intractable one. The problem can, however, be transformed into equivalent and simplified versions by making certain assumptions. In order to state these assumptions and the problem transformation on a formal basis, the notion of characterization is introduced. A characterization is a mapping of the database state space into a simplified parameter space. Meaningful simplification of the original problem is possible only when suitable characterizations can be found. The problem formulations in several important papers are reviewed and a detailed example is represented to illustrate some ideas. GRA

N80-19987# National Library of Medicine, Bethesda, Md.
NLM ONLINE SERVICES REFERENCE MANUAL
Jan. 1980 582 p Revised
(PB80-114531; NLM/MED-79/06) Avail: NTIS HC A25/MF A01 CSCL 05B

The operation of the various NLM online data bases is described. Specific information on modes of accessing these data bases, the commands which may be used, techniques for searching them, etc., is given. Instructions on the use of MEDLINE, AVLINE, CATLINE, NAME AUTHORITY FILE, SERLINE, TOXLINE, CHEMLINE, RTECS, TOXICOLOGY DATA BANK, CANCERLIT, CANCERPROJ, CLINPROT, EPILEPSY, MEDLEARN, BIOETHICS, HISTLINE, and HEALTH PLANNING AND ADMINISTRATION are included. GRA

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N80-19988# Committee on Science and Technology (U. S. House).
NASA AUTHORIZATION, 1981, PROGRAM REVIEW, VOLUME 2
Washington GPO 1980 275 p refs Hearings before the Subcomm. on Transportation, Aviation and Communications of the Comm. on Sci. and Technol., 96th Congr., 1st Sess., 30-31 Oct. 1979
(GPO-56-220) Avail: Subcomm. on Transportation, Aviation and Communications

A program review of NASA activities is presented with emphasis on the progress made in aeronautics during the past 12 months. Aerodynamics, materials and structures, aeronautical propulsion, and avionics and human factors are among the topics covered. Also, advances in vehicle technology are discussed including transport aircraft, general aviation aircraft, low speed aircraft, and high speed aircraft. J.M.S.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation, and 44 Energy Production and Conversion.*

N80-19989*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
EFFECTS OF TUNNEL AND STATION SIZE ON THE COSTS AND SERVICE OF SUBWAY TRANSIT SYSTEMS Final Report
Bain Dayman, Jr. Apr. 1979 55 p refs Sponsored by NASA
(Contract DOT-AS-60019)
(UMTA-CA-06-0116-79-2; JPL-Pub-79-67) Avail: NTIS HC A04/MF A01

The feasibility of less spacious, less costly underground rail mass transit system designs is studied. The major cost saving expected from alternative tunnel designs results from using precast concrete segment liners in place of steel. The saving expected for a two-foot decrease in the diameter of twin, single track tunnels is about two million dollars per route mile from 13 million dollars for precast concrete segment liners (a saving of about 16%). The cost per route-mile of a double track tunnel appears to be 15 to 25% higher than for the twin, single track tunnels. The effective cost saving expected from stations with four-car train capability instead of the usual eight-car trains is nearly 25% or seven million dollars per route mile. The saving in station costs can be obtained while improving service to the user (lower transit time and less waiting for trains) up to a capacity of 36,000 riders per hour in each direction. K.L.

N80-19990# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
LOW-COST BUS-TUNNELS TO THE CENTRAL BUSINESS DISTRICT Final Report
Bain Jr. Dayman Nov. 1979 61 p refs
(Contract DOT-AS-600019)
(UMTA-CA-06-0116-79-1; JPL-Pub-79-57) Avail: NTIS HC A04/MF A01

The feasibility of using small diameter unventilated, hence relatively inexpensive tunnels for bus links between the central business district and outlying areas was investigated. The tunnels selected were 16 1/2 ft. inside diameter, the same as a single-track tunnel conventionally used for recently constructed U.S. subway rail systems. Concentration levels of exhaust emissions were within acceptable limits to a capacity of 150 diesel buses per hour for a one route-mile bus-tunnel; for a two route-mile tunnel, 54 buses per hour were acceptable. The costs of such an underground guideway are moderate ($16M per route-mile with simultaneous operation in both directions). Such a guideway can serve as a precursor to a Metro system since it can be converted to use by rail vehicles with little additional cost. An underground station is not mandatory to the bus-tunnel concept. A.R.H.

N80-19991# Systems Technology, Inc., Hawthorne, Calif.
DEVELOPMENT OF AERODYNAMIC DISTURBANCE TEST PROCEDURES, VOLUME 1: EXECUTIVE SUMMARY Final Report, 30 Sep. 1977 - 30 Mar. 1979
Richard H. Klein and Jeffrey R. Hogue Aug. 1979 33 p refs
(Contract DOT-HS-7-01716)
(PB80-108145; STI-TR-1117-1-Vol-1; DOT-HS-805078) Avail: NTIS HC A03/MF A01 CSCL 13F

The crosswind responses of twenty different vehicles were surveyed. Three test procedures were used in three different crosswind disturbance configurations. These were steering fixed, steering free, and driver control of lane position. The crosswind configurations were straight pulse, doublet pulse, and a shaped profile. Results show that passenger cars, station wagons, trucks, and most vans have virtually no crosswind sensitivity problems, whereas the VW Microbus, the pick/up camper (in winds higher than 35 mph), cars pulling trailers, and mopeds do have potential problems. GRA

N80-19992# Virginia Polytechnic Inst. and State Univ., Blacksburg.
AN EXPERIMENTAL STUDY OF HIGHWAY AERODYNAMIC INTERFERENCES Final Report, Apr. 1977 - Oct. 1978
D. P. Telionis, C. J. Fahrner, and G. S. Jones Nov. 1978 82 p refs
(Contract DOT-HS-7-01590)
(PB80-109986; DOT-HS-805025) Avail: NTIS HC A05/MF A01 CSCL 13F

The aerodynamic forces of interference between two vehicles passenger cars and articulated trucks are investigated experimentally. Tests are conducted in the VPI towing tank and wind tunnels. The results have a rather qualitative character and indicate the order of magnitude of the expected forces and moments. The data match with reasonable accuracy with earlier test cases. It is revealed that the critical area is in the neighborhood of the front of the truck cabin for both the parallel passing and the opposite crossing. Overshoots of 50% to 100% of the aerodynamic components are encountered in very short periods of time. GRA

N80-19993# Gannett, Fleming, Corddry and Carpenter, Inc., Harrisburg, Pa.
EVALUATION OF OPERATION AND MAINTENANCE FACTORS LIMITING BIOLOGICAL WASTEWATER TREATMENT PLANT PERFORMANCE Final Report
Albert C. Gray, Jr., Paul E. Paul, and Hush D. Roberts Jul. 1979 168 p refs
(Contract EPA-68-03-2223)
(PB80-108947; EPA-600/2-79-078) Avail: NTIS HC A08/MF A01 CSCL 13B

Operations and maintenance programs at municipal biological wastewater treatment facilities were evaluated. The deficiencies in the areas of design, operation, maintenance, and administration were identified along with the deficiencies that could be overcome and operations that could be improved to upgrade plant performance to meet standards. Conclusions and recommendations are based on site visits made to 120 facilities and comprehensive evaluations conducted at 30 facilities. The highest ranked problem areas, based on frequency of a occurrence and severity of impact, were operator application of treatment concepts and testing to process control, infiltration/inflow, process control testing procedures, adequacy of operations and maintenance manual, industrial loading, training, hydraulic loading, treatment understanding, process controllability, and sludge treatment.GRA

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N80-19994*# National Aeronautics and Space Administration, Washington, D. C.
X-RAY OPTICAL PROPERTIES OF A WOLTER TELESCOPE
A. Ondrusch Feb. 1980 77 p refs Transl. into ENGLISH of "Roentgenoptische Eigenschaften Eines Wiertelskops", Rept. MPI-PAE/Extraterr-146 Max-Planck-Inst. fuer Phys. und Astrophysik, Inst. fur Extraterrestrische Phys., Garching, West Germany, Sep. 1978 92 p Translation was announced as N79-33123 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(NASA-TM-75811; MPI-PAE/Extraterr-146) Avail: NTIS HC A05/MF A01 CSCL 03A

Physical properties and the fabrication sequence of a Wolter telescope are discussed. Such telescopes are intended to examine the dust scattering halos after being placed in orbit by a booster rocket launched from Australia. R.E.S.

N80-19995*# Bardon Environmental Consultants, Inc., Birmingham, Ala.
ANALYSIS OF NOAA-MSFC GOES X-RAY TELESCOPE Final Report
David L. Shealy 31 Jul. 1979 53 p refs
(NASA Order H-34373-B)
(NASA-CR-161397) Avail: NTIS HC A04/MF A01 CSCL 03A

The general telescope system was assumed to be a paraboloid-hyperboloid in a Wolter Type 1 configuration. The equations which specify the telescope parameters and the resolution as a function of the collecting area are discussed as well as the spot size and point response function for off-axis rays. The measured resolution of the Goddard ATM X-ray telescope (S-056) is compared to the rms blur circle radius and the full width half maximum of the line spread function. An empirical scaling formula, Eq. 26, which transforms the rms blur circle radius into a more accurate measure of resolution, is introduced. The geometrical imaging properties of the proposed NOAA-MSFC GOES X-ray telescope are considered. Conclusions and alternate mirror designs are included. A.R.H.

N80-19996*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
APPLICATION OF DIGITAL IMAGE PROCESSING TECHNIQUES TO ASTRONOMICAL IMAGERY, 1979
Jean J. Lorre 1 Nov. 1979 75 p refs Original contains color illustrations
(Contract NAS7-100)
(NASA-CR-162877; JPL-Pub-79-109) Avail: NTIS HC A04/MF A01 CSCL 03A

Several areas of applications of image processing to astronomy were identified and discussed. These areas include: (1) deconvolution for atmospheric seeing compensation; a comparison between maximum entropy and conventional Wiener algorithms; (2) polarization in galaxies from photographic plates; (3) time changes in M87 and methods of displaying these changes; (4) comparing emission line images in planetary nebulae; and (5) log intensity, hue saturation intensity, and principal component color enhancements of M82. Examples are presented of these techniques applied to a variety of objects. A.W.H.

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N80-19997*# National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.
INTERPLANETARY MEDIUM DATA BOOK, SUPPLEMENT, 1975 - 1978
Joseph H. King Dec. 1979 279 p
(NASA-TM-80759; NSSDC/WDC-A-R&S-79-08-Suppl-1) Avail: NTIS HC A13/MF A01 CSCL 03B

Since the issurance of the Interplanetary Medium Data Book (NSSDC/WDC-A-R&S 77-04, 1977) which contains plots and listings of hourly average interplanetary field and plasma parameters covering the period November 27, 1963 through December 30, 1975, additional data are available which fill some 1975 data gaps and which extend the data coverage well into 1978. This supplment contains all the presently available data for the years 1975-1978. Interplanetary magneic field (IMF) data are from the IMP 8 triaxial fluxgate magnetometer experiment. Derived plasma parameters are form the IMP 7 and

IMP 8 instruments. Some of the early 1975 IMF data are from a HEOS 1 experiment. A.R.H.

N80-19998*# National Aeronautics and Space Administration, Washington, D. C.
ON THE CONTINUING STELLAR FORMATION IN THE CENTRAL REGIONS OF SOME GLOBULAR CLUSTERS AND THEIR RELATION TO THE PULSARS
B. V. Komberg Sep. 1979 22 p refs Transl. into ENGLISH of "O Prodolzhayushchemsya Zvezdoobrazovanii v Tsentral-nykh Oblastyakh Nekotorykh Sharovikh Skopleniy i Svyaz Poslednykh s Pulsarami", Rept. Pr-313 Academy of Sci. USSR, Inst. of Space Res., Moscow, 1977 p 1-26 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3198)
(NASA-TM-75703; Pr-313) Avail: NTIS HC A02/MF A01 CSCL 03B

The discrepancy between the predicted and observed quantities of gas in the central regions of massive globular clusters is discussed. It is hypothesized that star formation continues in the central regions by means of gas released during stellar evolution or trapped by the central region when the globular clusters pass through the center of the galaxy. Nine globular clusters are indicated at distances less than 1000 ps from which radio pulsars or X-ray sources are observed. It is argued that they could have formed relatively recently in closed pairs in the central regions and then ejected at the stage of supernova bursts with velocities over 100 ks/s. K.L.

N80-19999*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
GRAVITATIONAL REDSHIFT SPACE-PROBE EXPERIMENT Final Report
R. F. C. Vessot and M. W. Levine Dec. 1979 147 p refs
(Contract NAS8-27969)
(NASA-CR-161409) Avail: NTIS HC A07/MF A01 CSCL 03B

A Scout D rocket was launched from Wallops Island, Virginia, carrying an atomic hydrogen maser oscillator system as the payload. The frequency of signals from the oscillator was monitored on the ground at Merritt Island, Florida, by using two hydrogen masers as comparison oscillators. The first-order Doppler shift in the signals was eliminated by a go-return transponder link to the payload, and the resulting data, representing the relativistic shifts, were recovered and recorded. The objective was to measure directly the effect of gravitational potential on the frequency of an atomic hydrogen maser assuming it to be a 'proper' clock. A gravitational effect amounting to some 4.5 parts in 10 to the 10th power was measured with an oscillator having a stability better than 1 part in 10 to the 14th power. Therefore, to make the best possible use of the oscillator, all frequency shifts at the 2 to 5 X 10 to the -15 power level in delta f/f in the system must be accounted for. This includes all the phase variations that can cause such a shift to appear. The experiment, the data available and the manner in which they were processed, and the results are described. A.R.H.

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N80-20000# Ballistic Research Labs., Aberdeen Proving Ground, Md.
THE THEORETICAL TREATMENT OF PARTICLE SWARMS Final Report
R. D. Shelton and A. L. Arbuckle Sep. 1979 64 p refs
(DA Proj. 1L1-62618-AH-80)
(AD-A078218; AD-E430336; ARBRL-TR-02195) Avail: NTIS HC A04/MF A01 CSCL 20/8

Particle swarms come into consideration when a group of independent particles move without collision in a force field such that a fluid Hamiltonian can be written to represent the motion. Typical problems from several fields are collected and united under a single theoretical framework. The fields include such problems as fragment distributions from an exploding warhead, micrometeoroid distributions in the vicinity of the Earth, charged particle distributions in a magnetic bottle, focussing of photons by heavy stars and the design of a sprinkler system for uniform wetting. GRA

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N80-20001*# California Inst. of Tech., Pasadena.
EMPIRICAL STUDIES OF SOLAR FLARES: COMPARISON OF X-RAY AND H ALPHA FILTERGRAMS AND ANALYSIS OF THE ENERGY BALANCE OF THE X-RAY PLASMA Final Report, 17 Nov. 1978 - 16 Nov. 1979
R. L. Moore 16 Nov. 1979 15 p refs
(Contract NAS8-33215)
(NASA-CR-161405) Avail: NTIS HC A02/MF A01 CSCL 03B

The physics of solar flares was investigated through a combined analysis of X-ray filtergrams of the high temperature coronal component of flares and H alpha filtergrams of the low temperature chromospheric component. The data were used to study the magnetic field configuration and its changes in solar flares, and to examine the chromospheric location and structure of X-ray bright points (XPB) and XPB flares. Each topic and the germane data are discussed. The energy balance of the thermal X-ray plasma in flares, while not studied, is addressed. A.W.H.

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N80-20002*# University of West Florida, Pensacola.
A NOTE ON THE REVISED GALACTIC NEUTRON SPECTRUM OF THE AMES COLLABORATIVE STUDY Final Report
Hermann J. Schaefer Mar. 1980 9 p refs
(Contract NAS9-15417)
(NASA-CR-150554) Avail: NTIS HC A02/MF A01 CSCL 03B

Energy distributions of the neutron dose equivalents in the 0.1 to 300 Mev interval for the Ames and Hess spectra are compared. The Ames spectrum shows no evaporation peak, moves the bulk of the flux away from the region of elastic collision and spreads it more evenly over higher energies. The neutron spectrum in space does not seem to bear out the Ames model. Emulsion findings on all manned missions of the past consistently indicate that evaporation events are a prolific source of neutrons in space. A.R.H.

99 GENERAL

N80-20003*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CONFERENCE OF REMOTE SENSING EDUCATORS (CORSE-78)
Washington Mar. 1978 664 p refs Conf. held at Stanford, Calif., 26-30 Jun. 1978
(NASA-CP-2102; A-7755) Avail: NTIS HC A99/MF A01

CSCL 05I

Ways of improving the teaching of remote sensing students at colleges and universities are discussed. Formal papers and workshops on various Earth resources disciplines, image interpretation, and data processing concepts are presented. An inventory of existing remote sensing and related subject cources being given in western regional universities is included. For individual titles, see N80-20004 through N80-20017.

N80-20004*# California Univ., Berkeley. Space Sciences Lab.

HISTORY AND FUTURE OF REMOTE SENSING TECHNOLOGY AND EDUCATION

Robert N. Colwell *In* NASA. Ames Res. Center Conf. of Remote Sensing Educators (CORSE-78) Mar. 1980 p 3-92 refs (For primary document see N80-20003 10-99)

Avail: NTIS HC A99/MF A01 CSCL 05I

A historical overview of the discovery and development of photography, related sciences, and remote sensing technology is presented. The role of education to date in the development of remote sensing is discussed. The probable future and potential of remote sensing and training is described. R.E.S.

N80-20005*# California Univ., Berkeley. Space Sciences Lab.

IS REMOTE SENSING FAR OUT?

Ida R. Hoos *In* NASA. Ames Res. Center Conf. of Remote Sensing Educators (CORSE-78) Mar. 1980 p 93-102 refs (For primary document see N80-20003 10-99)

Avail: NTIS HC A99/MF A01 CSCL 05I

A discussion of the perspective of remote sensing education is presented. Questions as to 'whose perspective it is' and 'on what does the perspective depend' are considered. R.E.S.

N80-20006*# California Univ., Santa Barbara. Dept. of Geography.

THE ATTRIBUTES OF A WELL-TRAINED REMOTE SENSING TECHNOLOGIST

John E. Estes *In* NASA. Ames Res. Center Conf. of Remote Sensing Educators (CORSE-78) Mar. 1980 p 103-118 refs (For primary document see N80-20003 10-99)

Avail: NTIS HC A99/MF A01 CSCL 05I

Central concepts important to the training of the remote sensing technologist are presented. What employers appear to be looking for at this time in a prospective employee is discussed along with some ways in which faculty can get students interested in remote sensing. The attributes of a prime candidate and his goals are described. The current status of remote sensing education in colleges and universities is presented. R.E.S.

N80-20007*# Arizona Univ., Tucson.

A MULTIDISCIPLINARY APPROACH TO REMOTE SENSING EDUCATION

Philip N. Slater *In* NASA. Ames Res. Center Conf. of Remote Sensing Educators (CORSE-78) Mar. 1980 p 119-134 *ref* (For primary document see N80-20003 10-99)

Avail: NTIS HC A99/MF A01 CSCL 05I

The multidisciplinary aspect of the remote sensing educational program at the University of Arizona is described. The philosophy of the multidisciplinary approach is discussed. R.E.S.

N80-20008*# South Dakota State Univ., Brookings. Remote Sensing Inst.

REMOTE SENSING RESEARCH ACTIVITIES RELATED TO ACADEMIC INSTITUTIONS

Victor I. Myers *In* NASA. Ames Res. Center Conf. of Remote Sensing Educators (CORSE-78) Mar. 1980 p 135-164 refs (For primary document see N80-20003 10-99)

Avail: NTIS HC A99/MF A01 CSCL 05I

The role of research in the educational setting is discussed. Curriculum developments for integrating teaching and research are described. Remote sensing technology is used as an example of bridging the gap between research and application. Recommendations are presented for strengthing research groups. R.E.S.

N80-20009*# National Aeronautics and Space Administration, Washington, D. C.

NASA PROGRAMS IN TECHNOLOGY TRANSFER AND THEIR RELATION TO REMOTE SENSING EDUCATION

Richard H. Weinstein *In* NASA. Ames Res. Center Conf. of Remote Sensing Educators (CORSE-78) Mar. 1980 p 165-180 (For primary document see N80-20003 10-99)

Avail: NTIS HC A99/MF A01 CSCL 05I

Technology transfer to users is a central feature of NASA programs. In each major area of responsibility, a variety of mechanisms was established to provide for this transfer of operational capability to the proper end user, be it a Federal agency, industry, or other public sector users. In addition, the Technology Utilization program was established to cut across all program areas and to make available a wealth of 'spinoff' technology (i.e., secondary applications of space technology to ground-based use). The transfer of remote sensing technology, particularly to state and local users, presents some real challenges in application and education for NASA and the university community. The agency's approach to the transfer of remote sensing technology and the current and potential role of universities in the process are considered. A.R.H.

N80-20010*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

NASA'S WESTERN REGIONAL APPLICATIONS TRAINING ACTIVITY

Charles E. Poulton *In its* Conf. of Remote Sensing Educators (CORSE-78) Mar. 1980 p 181-196 (For primary document see N80-20003 10-99)

Avail: NTIS HC A99/MF A01 CSCL 05I

Direct involvement of educational institutions in the transfer of remote sensing technology must be increased so that the training component of the Weston Regional Applications Program can be expanded within the various states. The implications of essential goals in remote sensing education and training are considered in relation to the functions of the NASA University Affairs program. A.R.H.

N80-20011*# Colorado State Univ., Fort Collins.

OPPORTUNITIES AND PROBLEMS IN INTRODUCING OR EXPANDING THE TEACHING OF REMOTE SENSING IN UNIVERSITIES

Eugene L. Maxwell *In* NASA. Ames Res. Center Conf. of Remote Sensing Educators (CORSE-78) Mar. 1980 p 197-210 (For primary document see N80-20003 10-99)

Avail: NTIS HC A99/MF A01 CSCL 05I

The need for degree programs in remote sensing is considered. Any education program which claims to train remote sensing specialists must include expertise in the physical principles upon which remote sensing is based. These principles dictate the limits of engineering and design, computer analysis, photogrammetry, and photointerpretation. Faculty members must be hired to provide emphasis in those five areas. A.R.H.

N80-20012*# Idaho Univ., Moscow.

THE USE OF MULTIMEDIA AND PROGRAMMED TEACHING MACHINES FOR REMOTE SENSING EDUCATION

Joseph J. Ulliman *In* NASA. Ames Res. Center Conf. of Remote Sensing Educators (CORSE-78) Mar. 1980 p 211-262 refs (For primary document see N80-20003 10-99)

Avail: NTIS HC A99/MF A01 CSCL 05I

The advantages, limitations, and uses of various audio visual equipments and techniques used in various universities for individualized and group instruction in the interpretation and classification of remotely sensed data are considered as well as systems for programmed and computer-assisted instruction. A.R.H.

N80-20013*# Santa Clara Univ., Calif.

COMPUTER APPLICATIONS IN REMOTE SENSING EDUCATION

Ronald L. Danielson *In* NASA. Ames Res. Center Conf. of Remote Sensing Educators (CORSE-78) Mar. 1980 p 263-268 refs (For primary document see N80-20003 10-99)

Avail: NTIS HC A99/MF A01 CSCL 09B

Computer applications to instruction in any field may be divided into two broad generic classes: computer-managed instruction and computer-assisted instruction. The division is based on how frequently the computer affects the instructional process and how active a role the computer affects the instructional

process and how active a role the computer takes in actually providing instruction. There are no inherent characteristics of remote sensing education to preclude the use of one or both of these techniques, depending on the computer facilities available to the instructor. The characteristics of the two classes are summarized, potential applications to remote sensing education are discussed, and the advantages and disadvantages of computer applications to the instructional process are considered. A.R.H.

N80-20014*# Denver Univ., Colo.
TEXTBOOKS AND TECHNICAL REFERENCES FOR REMOTE SENSING
Robert D. Rudd, Leonard W. Bowden (California Univ., Riverside), Robert N. Colwell (California Univ., Berkeley), and John E. Estes (California Univ., Santa Barbara) *In* NASA. Ames Res. Center Conf. of Remote Sensing Educators (CORSE-78) Mar. 1980 p 269-288 refs (For primary document see N80-20003 10-99)
Avail: NTIS HC A99/MF A01 CSCL 05B

A selective bibliography is presented which cites 89 textbooks, monographs, and articles covering introductory and advanced remote sensing techniques, photointerpretation, photogrammetry, and image processing. A.R.H.

N80-20015*# Arizona Univ., Tucson.
THE POINTABLE MULTISPECTRAL LINEAR ARRAY SYSTEM AND THE LARGE FORMAT CAMERA FOR EARLY 1980 SHUTTLE PAYLOADS
Philip N. Slater *In* NASA. Ames Res. Center Conf. of Remote Sensing Educators (CORSE-78) Mar. 1980 p 367-390 (For primary document see N80-20003 10-99)
Avail: NTIS HC A99/MF A01 CSCL 14E

Design options are described for the multispectral linear arrays which will provide data and facilities beyond those obtained by LANDSAT 1, 2, 3, and D (the thematic mapper) are considered. The features, uses, and risks of a 10M fine resolution pointable imager, a 15M/30M dual resolution pointable imager, a 30M selectable spectral resolution pointing imager, a 30M electronically pointable multi-temporal sampler, and a 40M/80M mixed resolution imager are described. A large format camera scheduled for 1981 shuttle launch which can obtain high spatial ground resolution (approximately 10M), a relative position accuracy of plus or minus 14M, and a relative heightening accuracy, by virtue of stereographic coverage, of between 7 and 28M depending on the base-to-height ratio used. A potential problem of the system is that it will orbit in the shuttle. A.R.H.

N80-20016*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DATA REDUCTION BY COMPUTER PROCESSING
Dale R. Lumb *In its* Conf. of Remote Sensing Educators (CORSE-78) Mar. 1980 p 391-452 refs (For primary document see N80-20003 10-99)
Avail: NTIS HC A99/MF A01 CSCL 09B

The automated analysis of remote sensing data, specifically digital processing of LANDSAT or other image data in numerical form was considered in a technical workshop which covered the teaching of digital image processing, including both theoretical and applied subjects and laboratory experience, and also reviewed NASA developed image processing software, and hardware/software systems employed at NASA-Ames Research Center in support of the Western Regional Applications Program (WRAP). A course titled Image Processing Lab, one of two courses required for a graduate minor in remote sensing at Arizona is examined as well as the rationale, content, and hardware/software support for this course. A.R.H.

N80-20017*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE REDUCTION OF REMOTE SENSING DATA BY VISUAL MEANS
Robert N. Colwell (California Univ., Berkeley), Charles E. Poulton, and Barry J. Schrumpf (Oregon State Univ., Corvallis) *In its* Conf. of Remote Sensing Educators (CORSE-78) Mar. 1980 p 453-526 refs (For primary document see N80-20003 10-99)
Avail: NTIS HC A99/MF A01 CSCL 05B

Issues likely to be of concern to educators called upon to teach courses involving the reduction (interpretation) of remotely sensed data by visual means are considered. Topics covered include: (1) information requirements of those using remotely-sensed data; (2) educational concepts involved in teaching students how to generate the desired information from a visual analysis of the data; (3) principles and techniques specific to the photointerpretation process; (4) concepts involved in the making of photographic measurements, as dictated by the geometry of remote sensing imagery; (5) the nature of the various kinds of mapping, plotting, and photointerpretation equipment; and (6) some special considerations with respect to the convergence of evidence and other principles involved in the interpretation of photographs. A recommended procedure for determining the usefulness of any given type of aerial or space photography in relation to the inventory of natural resources is included. A.R.H.

N80-20018# Association for Unmanned Vehicle Systems, Dayton, Ohio.
PROCEEDINGS OF THE ASSOCIATION FOR UNMANNED VEHICLE SYSTEMS AUVS '79: 6TH ANNUAL CONVENTION
1979 165 p refs Conv. held at San Diego, Calif., 29 May - 1 Jun. 1979
(AD-A077877) Avail: NTIS HC A08/MF A01 CSCL 01/3

Contents: Unmanned Vehicles on the Tactical Battlefield - Another Beginning: Why Unmanned Vehicles Can Be Effective: Unmanned Battlefield Reconnaissance Systems For The German Army: Automated Guidance for Ground Vehicles: Cruise Missile Air Launch In the Operational Environment: Advances In Anti-Jam Transmission of Reconnaissance Imagery Data: Unmanned Seaplanes For Naval Operations: Unmanned Systems For Reducing Our Taxes: and Cruising The Planets. GRA

N80-20019# Texas Technological Univ., Lubbock. Inst. for Electronics Science.
ANNUAL REVIEW OF RESEARCH UNDER THE JOINT SERVICE ELECTRONICS PROGRAM Interim Report
R. Saeks, K. S. Chao, J. Walkup, T. Newman, and L. R. Hunt Oct. 1979 160 p refs
(Contract N00014-76-C-1136)
(AD-A077652) Avail: NTIS HC A08/MF A01 CSCL 09/4

Contents: Quadratic Optimization Problems; Nonlinear Control; Nonlinear Fault Analysis; Qualitative Analysis of Large Scale Systems; Multidimensional System Theory; Optical Noise; and Pattern Recognition. GRA

N80-20020# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
AIR FORCE FLIGHT DYNAMICS LABORATORY FISCAL YEAR 1981. TECHNICAL OBJECTIVE DOCUMENT
Dec. 1979 87 p refs Supersedes AFFDL-TR-78-181
(AD-A078973; AFFDL-TR-79-3133; AFFDL-TR-78-181) Avail: NTIS HC A05/MF A01 CSCL 01/3

The document presents an overview of the four Technical Planning Objectives (TPO) and supporting data for each. These are extracted from the technical plan of the Air Force Flight Dynamics Laboratory (AFFDL). Information is largely based on AFFDL fiscal 1981 technology plan omitting specific funding and timing information of an 'Official Use Only' nature. Technical objectives are described for the technical areas of Structures and Dynamics, Vehicle Equipment/Subsystems, Flight Control and Aeromechanics. Points of contact for more information in each of the areas are identified. GRA

N80-20021# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ADVANCED ELECTRONIC TECHNOLOGY Quarterly Technical Summary Report, 1 May - 31 Jul. 1979
Alan J. McLaughlin and Alan L. McWhorter 25 Sep. 1979 22 p
(Contract F19628-78-C-0002; AF Proj. 649L)
(AD-A077589; ESD-TR-79-195) Avail: NTIS HC A02/MF A01 CSCL 09/5

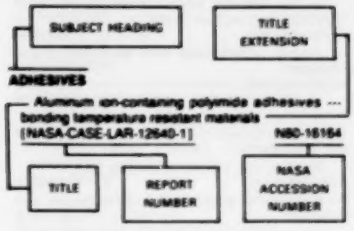
Progress is reported in the following areas: digital integrated circuits, high-speed digital circuits, MNOS Memory, reconfigurable logic devices, processing, testing, and analysis, computer systems, solid state device research, quantum electronics, materials research, microelectronics, and analog device technology. A.R.H.

N80-20022* National Bureau of Standards, Washington, D.C.
JOURNAL OF RESEARCH OF THE NATIONAL BUREAU OF STANDARDS, VOLUME 84, NO. 5 Bimonthly Report, Sep. - Oct. 1979
1979 95 p refs
(PB80-103674) Avail: NTIS HC A05/MF A01 CSCL 07D

Results of research in the physical and engineering sciences, including physics, chemistry, engineering, mathematics, and computer science, is reported. Major emphasis is placed on measurement methodology and the basic technology underlying standardization. Specific topics covered include: (1) a high precision load cell mass comparator; (2) modulus and swelling relations in natural rubber crosslinked by dicumyl peroxide; (3) flow-induced fibril formation in polymer solutions; (4) surface changes in platinum crucibles; and (5) isoionic isotope exchange with hydroxylapatite and the dilution effect. J.M.S.

SUBJECT INDEX

Typical Subject Index Listing



The subject heading is the key to the subject content of the document. Titles, report numbers, and accession numbers of pertinent documents are provided under each subject heading. When the title is insufficiently descriptive of the document content, a title extension has been added, separated from the title by three hyphens. The report number helps to indicate the type of document cited (e.g., NASA report, NASA translation, NASA contractor report). The NASA accession number is the number by which the document abstracts are arranged in this journal and by which the document is sold or requested. The titles, with title extensions if present, are arranged under each subject heading in ascending accession number order. The subject headings have been selected from the latest revision of the *NASA Thesaurus* (NASA SP-7050).

A

A-7 AIRCRAFT
The A-7 head-up display reliability programme N80-19539

A-10 AIRCRAFT
Avionics interface data summaries: A-10A, EF-111A, F-4G, F-4G, F-15A, F-18A, F-111A, F-111E, F-111F, RF-4C
[AD-A077368] N80-19105

ABLATIVE MATERIALS
Rocket motor blast effects and proposed ablative protection for RAM launching system EX 43
[AD-A077037] N80-19190

ABSORBERS (EQUIPMENT)
Wave power extraction by floating bodies
[AD-A078058] N80-19637

ABSORPTION CROSS SECTIONS
Dissociative and double photoionization of CO2 from threshold to 90 A
[NASA-CR-162844] N80-19929

ABSORPTION SPECTRA
Possibilities of using radiation in the oxygen absorption line at lambda = 2.53 mm on slant paths for thermal sounding of the atmosphere
[BLL-TRANS-1402-(9022.549)] N80-19681

ABSORPTION SPECTROSCOPY
X-ray absorption studies of graphite intercalates and metal ammonia solutions
[LBL-9840] N80-19212

ACCELERATION TOLERANCE
Cardiovascular reaction to periodic head-pelvis accelerations on a short-arm centrifuge N80-19760

ACCLIMATIZATION
Certain questions of the acclimatization of construction workers to the conditions of a subtropical climate
[NASA-TM-75728] N80-19787

ACCURACY
Improving the performance and accuracy of external cylindrical grinding N80-19313

ACETYLENE
Conduction in polydiacetylene bilayers
[AD-A078755] N80-19279

ACID BASE EQUILIBRIUM
Design of a program for expert diagnosis of acid base and electrolyte disturbances
[AD-A078413] N80-19226

ACOUSTIC ATTENUATION
Report on the use of abatement techniques for problems related to vibrations and noise N80-19583

ACOUSTIC EXCITATION
Damping problems in acoustic fatigue N80-19580

ACOUSTIC MEASUREMENTS
Aerodynamic and acoustic investigations of axial flow fan and compressor blade rows, including three-dimensional effects
[AD-A077712] N80-19116
Research on nondestructive testing
[AD-A078483] N80-19517

ACOUSTIC SIMULATION
Methods of sound simulation and applications in flight simulators
[NASA-TM-75788] N80-19133

ACOUSTICS
Solid propellant combustion mechanism research
[AD-A078831] N80-19301

ACOUSTO-OPTICS
Acoustooptic spectrum analysis and narrowband interference excision in wideband signal environments
[AD-A078286] N80-19325
Acoustic microscopy for nondestructive evaluation of materials
[AD-A078088] N80-19518
DEFT: Advanced structures and applications
[AD-A075373] N80-19947

ACTIVITY CYCLES (BIOLOGY)
Scheduling work and rest periods during long-term space flights N80-19758

ACTUATION
Nonelectronic aspects of avionic system reliability — actuation N80-19535

ADAPTIVE CONTROL
Pointing accuracy and dynamic range in a steered beam adaptive array
[AD-A078750] N80-19331

ADAPTIVE OPTICS
Analytical studies of phase estimation techniques, volume 1
[AD-A078006] N80-19944

ADDITIVES
Analysis of thermal decomposition products of flue gas conditioning agents
[PB80-111818] N80-19672

ADHESION
Effect of number of chemical bonds on the strength of adhesion between glass and polybutadiene
[AD-A078237] N80-19274

ADHESION TESTS
Effect of number of chemical bonds on the strength of adhesion between glass and polybutadiene
[AD-A078237] N80-19274

ADHESIVE BONDING
Surface treatment for aluminum bonding
[AD-A078950] N80-19254
Primary Adhesively Bonded Structure Technology (PABST). General material property data — bonding airframes
[AD-A077891] N80-19258
Development of surface interactions at polymer-metal interfaces
[AD-A077275] N80-19290

ADHESIVES
The fabrication and testing of prototype UH-1 aircraft windshields manufactured with a sheet interlayer
[AD-A077711] N80-19080
Primary Adhesively Bonded Structure Technology (PABST). General material property data — bonding airframes
[AD-A077891] N80-19258

ADRENAL GLAND
Functional changes in the adrenal cortex during simulation of stress situations in the presence of high carbon monoxide levels N80-19774

ADRENAL METABOLISM
Effects of long-term space flights on reactions of adrenal cortex and medulla N80-19759

ADRENOCORTICOTROPIN (ACTH)
Reaction of chickens to graduated length of exposure to stress
[NASA-TM-76071] N80-19754

AERIAL PHOTOGRAPHY
Texture extraction on the ILLIAC 4 — aerial images
[AD-A070523] N80-19471
Tri-bar reading correction for oblique imagery
[AD-A078340] N80-19600

AERIAL RECONNAISSANCE
Feasibility study on a Canadian civil SAR plan for search and rescue duties
[AD-A075392] N80-19050

AEROACOUSTICS
Aeroacoustic wind-tunnel tests of a light twin-boom general-aviation [illegible]plane with free or shrouded-pusher propellers — in the Langley full-scale tunnel
[NASA-TM-802[illegible]] N80-19023

AERODYNAMIC CHARACTERISTICS
Rotary balance data for a typical single-engine general aviation design for an angle-of-attack range of 8 deg to 90 deg. 1: Low-wing model A — fluid flow and vortices data for general aviation aircraft to determine aerodynamic characteristics for various designs
[NASA-CR-3100] N80-19030
A flight investigation of blade section aerodynamics for a helicopter main rotor having NLR-1T airfoil sections
[NASA-TM-80166] N80-19033
Wind tunnel test to investigate aerodynamic hysteresis phenomena of the F-4 and F-11 aircraft models
[AD-A077196] N80-19040
Proceedings of a Workshop on V/STOL Aircraft Aerodynamics, volume 2 — conferences
[AD-A078909] N80-19042
Core compressor exit stage study. 1: Aerodynamic and mechanical design
[NASA-CR-159714] N80-19113

AERODYNAMIC COEFFICIENTS
Aircraft identification experience N80-19100
Rotorcraft identification experience N80-19101
Identification experience in extreme flight regimes N80-19102
Wind tunnel and free flight model identification experience N80-19103
Closed loop aspects of aircraft identification N80-19104

AERODYNAMIC DRAG
Undercarriage drag prediction methods
[ESDU-79015] N80-19028

Influence of roughness and blowing on compressible turbulent boundary layer flow — skin friction drag
[AD-A077942] N80-19481

AERODYNAMIC FORCES
An experimental study of highway aerodynamic interference
[PB80-109886] N80-19992

AERODYNAMIC HEATING
Hypersonic interference flow flight experiment design — investigating aerodynamic heating and loads
[AD-A078861] N80-19044

AERODYNAMIC INTERFERENCE
Investigation of the airflow at rocket trajectory and wind sensor locations of a model helicopter simulating low speed flight. Application of model helicopter testing, laser velocity, and rotor wake flow visualization to investigate the aerodynamic interference at rocket trajectories and wind sensors of a helicopter operating in low speed flight
[AD-A075378] N80-19039

AERODYNAMIC LOADS
Hypersonic interference flow flight experiment design — investigating aerodynamic heating and loads
[AD-A078861] N80-19044

AERODYNAMIC NOISE
Visualization of unsteady jets and aerodynamic noise fields
[CUED/A-TURBO/TR-86] N80-19029
On the feedback phenomenon of an impinging jet
[AD-A078952] N80-19480

AERODYNAMIC STABILITY
Application of the Estimation-Before-Modeling (EBM) system identification method to the high angle of attack/sideslip flight of the T-2C jet trainer aircraft. Volume 3: Identification of T-2C aerodynamics stability and control characteristics from actual flight test data
[AD-A078924] N80-19072
Development of aerodynamic disturbance test procedures, volume 1: Executive summary
[PB80-108145] N80-19991
An experimental study of highway aerodynamic interference
[PB80-109886] N80-19992

AERODYNAMICS
Aeronautical engineering: A continuing bibliography with indexes (supplement 119)
[NASA-SP-7037(119)] N80-19021
Workshop on Aircraft Surface Representation for Aerodynamic Computation
[NASA-TM-81179] N80-19025
Digital computer solution of aircraft longitudinal and lateral directional dynamic characteristics
[AD-A078672] N80-19088
Application of the Estimation-Before-modeling (EBM) system identification method to the high angle of attack/sideslip flight of the T-2C jet trainer aircraft. Volume 1: Executive summary
[AD-A080025] N80-19073
Proceedings of a Workshop on V/STOL Aircraft Aerodynamics, volume 1
[AD-A079115] N80-19074
FORTRAN program oblique in PL-format user's manual
[AD-A077909] N80-19880
NASA authorization, 1981, program review, volume 2
[GPO-58-220] N80-19888
Air Force Flight Dynamics Laboratory fiscal year 1981. Technical objective document
[AD-A078873] N80-20020

AERONAUTICAL ENGINEERING
Aeronautical engineering: A continuing bibliography with indexes (supplement 119)
[NASA-SP-7037(119)] N80-19021
Human comfort response to random motions with combined yawing and rolling motions
[NASA-CR-159187] N80-19902
NASA authorization, 1981, program review, volume 2
[GPO-58-220] N80-19888
Air Force Flight Dynamics Laboratory fiscal year 1981. Technical objective document
[AD-A078873] N80-20020

AEROSOLS
Mathematical models for atmospheric pollutants. Appendix B: Chemical and physical properties of gases and aerosols
[EPRI-EA-1131-APP-B] N80-19667
Evaluation of methodology and prototype to measure atmospheric sulfuric acid
[PB80-107085] N80-19669

AEROSPACE ENGINEERING
Space construction and utility distribution
N80-19180
Rapid laboratory method for testing outgassing of thermostable plastics and rubber N80-19766

AEROSPACE ENVIRONMENTS
Space processing applications rocket project SPAR 4, engineering report
[NASA-TM-78235] N80-19173

AEROSPACE MEDICINE
USSR report: Space biology and aerospace medicine, v. 14, no.1
[JPRS-75251] N80-19755
Reaction of human blood to chronic exposure to low doses of carbon monoxide in a confined environment N80-19761
Probability of altitude decompression disorders when breathing oxygen containing human waste gases
N80-19762
Effect of hyperoxia on oxygen transport properties of blood N80-19763
External respiration and acid-base balance of human blood during long-term antiorthostatic hypokinesia and in the recovery period N80-19764
Distinctions in development of pyrogenal fever in animals following prolonged hypokinesia
N80-19765
Aerospace medicine and biology: A continuing bibliography with indexes, supplement 203
[NASA-SP-7011(203)] N80-19779
Aerospace medicine and biology: A continuing bibliography with indexes, supplement 204
[NASA-SP-7011(204)] N80-19781
Blood circulation under conditions of weightlessness
[NASA-TM-76036] N80-19786
The Thousand Aviator study: 1969 - 1971 follow-up program with distributions and intercorrelations of selected variables
[AD-A079700] N80-19789

AEROSPACE SCIENCES
The space science data service: A study of its efficiencies and costs
[NASA-TM-80760] N80-19982

AGENTS
Prospects for broadening the range of inorganic binding agents
[RTS-11804] N80-19216

AGING (BIOLOGY)
The Thousand Aviator study: 1969 - 1971 follow-up program with distributions and intercorrelations of selected variables
[AD-A079700] N80-19789

AGING (MATERIALS)
Fourier Transform Infrared Spectroscopy (FTIS). Volume 1: Technical Report — service life of solid rocket propellants
[AD-A079996] N80-19227
In vivo and in vitro aging of plasma-sprayed alumina on 316L stainless steel and Ti6Al-4V ELI substrates — prosthetic devices N80-19231
Mechanical properties of electroplated nickel rings for bath aging study
[BDX-613-2303] N80-19256

AGRICULTURAL AIRCRAFT
Monodisperse atomizers for agricultural aviation applications
[NASA-CR-159777] N80-19450

AGRICULTURE
Quantitative estimation of plant characteristics using spectral measurement: A survey of the literature
[E80-10078] N80-19587
Computer applications — agriculture
[LA-7844-PR] N80-19654

AH-1G HELICOPTER
A flight investigation of blade section aerodynamics for a helicopter main rotor having NLR-1T airfoil sections
[NASA-TM-80166] N80-19033

AILERONS
Experimental investigation of a circulation control aileron
[AD-A079825] N80-19048

AIR BREATHING ENGINES
The 4th International Symposium on Air Breathing Engines
[AD-A079858] N80-19114

AIR COOLING
Algorithm for calculating turbine cooling flow and the resulting decrease in turbine efficiency
[NASA-TM-81453] N80-19883

AIR CUSHION LANDING SYSTEMS
New remotely piloted vehicle launch and recovery concepts. Volume 1: Analysis, preliminary design and performance/cost trade studies
[AD-A077475] N80-19066
Analysis of trunk flutter in an air cushion landing system
[AD-A079008] N80-19075
Easy ACLS dynamic analysis, volume 2. Part 2: Component computer programs
[AD-A079803] N80-19076

AIR DEFENSE
The F-16 Wild Weasel: A feasibility study
[AD-A077050] N80-19071
Simulation of overall air defense command and control N80-19816
Theater air defense engagement simulation-command/control/communications ns-C3I): An approach to theater air defense model/methodology development N80-19817
Simulation of air defence operations and multiple air combat N80-19818
Simulation within military defence systems for training and evaluation N80-19819
SIMBOX: A general purpose defense systems simulator N80-19822
Use of simulation in the evaluation of the IFFN process N80-19833

AIR FILTERS
Dissemination, resuspension, and filtration of carbon fibers — aircraft fires N80-19196

AIR FLOW
Investigation of the airflow at rocket trajectory and wind sensor locations of a model helicopter simulating low speed flight. Application of model helicopter testing, laser velocity, and rotor wake flow visualization to investigate the aerodynamic interference at rocket trajectories and wind sensors of a helicopter operating in low speed flight
[AD-A075378] N80-19039

AIR LAND INTERACTIONS
Stability analysis of kinetic models of the global C-cycle: Exchange of carbon between land biota and atmosphere under the influence of man
[BLL-TRANS-1421-(9022.549)] N80-19702

AIR POLLUTION
Mathematical models for atmospheric pollutants. Appendix B: Chemical and physical properties of gases and aerosols
[EPRI-EA-1131-APP-B] N80-19667
Analysis of thermal decomposition products of flue gas conditioning agents
[PB80-111818] N80-19672
Setting priorities for control of fugitive particulate emissions from open sources
[PB80-108962] N80-19674
User's guide to the ELSTAR photochemical air quality simulation model
[PB80-109184] N80-19675
Sources of atmospheric cadmium
[PB80-121221] N80-19677

AIR PURIFICATION
Development of a nitrogen generation system
[NASA-CR-152333] N80-19800

AIR QUALITY
An empirical approach for relating annual TSP concentrations to particulate microinventory emissions data and monitor siting characteristics
[PB80-113756] N80-19676
Analyzing historical meteorological data for air quality analysis
[PB80-107154] N80-19743

AIR TO SURFACE MISSILES
Harpoon pyrotechnic shock study
[AD-A078727] N80-19175

AIR TRAFFIC CONTROL
Standard engineering installation package. Air Traffic Radio Channel Control (ATRCC) equipment [AD-A078648] N80-19059
Structures in aeronautical phraseology: From English to Spanish N80-19978
AIR WATER INTERACTIONS
SMMR simulator radiative transfer calibration model. 1: Derivation [E80-10081] N80-19589
Winter shamal in the Persian Gulf [AD-A077727] N80-19720
Equatorial Pacific Ocean variability: Seasonal and El Nino times scales [AD-A077031] N80-19724
AIRBORNE EQUIPMENT
A unique radio oceanographic radar [AD-A077364] N80-19332
Military adaption of a commercial VOR/ILS airborne radio with a reliability improvement warranty N80-19540
AIRBORNE SURVEILLANCE RADAR
Airborne radar approach system flight test experiment [AD-A077900] N80-19054
The application of modeling and simulation to the development of the E-3A N80-19823
AIRBORNE/SPACEBORNE COMPUTERS
Emulation applied to reliability analysis of reconfigurable, highly reliable, fault-tolerant computing systems N80-19541
E-3A navigational computer system real-time environmental simulator N80-19824
Simulation for integration with dynamic tests of the logical elements of principal onboard computers N80-19842
NSSC-2 operating system design requirements specification [NASA-CR-161396] N80-19861
AIRCRAFT ACCIDENTS
Aircraft emergency decisions: Cognitive and situational variables [AD-A077413] N80-19051
Assessment of Carbon Fiber Electrical Effects [NASA-CP-2119] N80-19193
Approach to the assessment of the hazard — fire released carbon fiber electrical effects N80-19194
Release of carbon fibers from burning composites N80-19195
Dissemination, resuspension, and filtration of carbon fibers — aircraft fires N80-19196
Large-scale fiber release and equipment exposure experiments — aircraft fires N80-19198
Surveys of facilities for the potential effects from the fallout of airborne graphite fibers N80-19199
Assessment of the risk due to release of carbon fiber in civil aircraft accidents, phase 2 N80-19200
AIRCRAFT COMMUNICATION
The role of HF in air-ground communications: An overview N80-19373
HF communication to small low flying aircraft N80-19374
Modern HF communications for low flying aircraft N80-19375
Modeling and Simulation of Avionics Systems and Command, Control and Communications systems — conference [AGARD-CP-268] N80-19809
A JTIDS performance model for the E-3A N80-19825
AIRCRAFT COMPARTMENTS
Evaluation of aircraft windshield materials in a simulated supersonic flight environment [AD-A078673] N80-19082
AIRCRAFT CONFIGURATIONS
Workshop on Aircraft Surface Representation for Aerodynamic Computation [NASA-TM-81170] N80-19025
A fault tolerant architecture approach to avionics reliability improvement N80-19533
AIRCRAFT CONTROL
Application of the Estimation-Before-Modeling (EBM) system identification method to the high angle of attack/sideslip flight of the T-2C jet trainer aircraft. Volume 3: Identification of T-2C aerodynamics stability and control characteristics from actual flight test data [AD-A079924] N80-19072
Parameter identification — conference on techniques applied to aircraft flight test data [AGARD-LS-104] N80-19094
Aircraft parameter identification methods and their applications: Survey and future aspects N80-19095
Identification evaluation methods N80-19096
Practical input signal design — For identifying stability and control derivatives N80-19097
Aircraft identification experience N80-19100
Rotorcraft identification experience N80-19101
Identification experience in extreme flight regimes N80-19102
Wind tunnel and free flight model identification experience N80-19103
Closed loop aspects of aircraft identification N80-19104
AIRCRAFT DESIGN
Rotary balance data for a typical single-engine general aviation design for an angle-of-attack range of 8 deg to 90 deg. 1: Low-wing model A — fluid flow and vortices data for general aviation aircraft to determine aerodynamic characteristics for various designs [NASA-CR-3100] N80-19030
The F-16 Wild Weasel: A feasibility study [AD-A077050] N80-19071
Thrust vectoring to eliminate the vertical stabilizer — to provide directional stability for f-111 aircraft while decreasing radar detectability [AD-A079852] N80-19077
NASA authorization, 1981, program review, volume 2 [GPO-56-220] N80-19988
AIRCRAFT DETECTION
Thrust vectoring to eliminate the vertical stabilizer — to provide directional stability for f-111 aircraft while decreasing radar detectability [AD-A079852] N80-19077
Prediction of radar coverage against very low altitude aircraft N80-19364
AIRCRAFT ENGINES
Accuracy and repeatability indices for joint oil analysis program data [AD-A078156] N80-19266
AIRCRAFT EQUIPMENT
Airborne radar approach system flight test experiment [AD-A077900] N80-19054
The F-16 Wild Weasel: A feasibility study [AD-A077050] N80-19071
An analytical and experimental study of aircraft hydraulic lines including the effect of mean flow [AD-A079746] N80-19079
Dynamic Environmental Qualification Techniques [AGARD-R-682] N80-19090
Dynamic environments and test simulation for qualification of aircraft equipment and external stores N80-19092
Civil aircraft equipment environment qualification techniques N80-19093
Comparison of specifications for Head-Up Displays in the Navy A-4M, A-7E, AV-8A, and F-14A aircraft [AD-A080047] N80-19106
Flight path displays [AD-A077181] N80-19107
Power system control study. Phase 1: Integrated control techniques [AD-A078629] N80-19125
NASA TLA workload analysis support. Volume 1: Detailed task scenarios for general aviation and metering and spacing studies [NASA-CR-3199] N80-19791
Simulation for integration with dynamic tests of the logical elements of principal onboard computers N80-19842
AIRCRAFT INSTRUMENTS
Methods used for discerning the reliability of military aircraft radar N80-19532
Reliability of high-brightness CRTs for airborne displays N80-19543
AIRCRAFT LANDING
Development of a normalized probability distribution for lateral load factors due to aircraft ground turning [AD-A077047] N80-19070
Easy ACLS dynamic analysis, volume 2. Part 2: Component computer programs [AD-A079803] N80-19076
A computer program for estimating aircraft landing distance [AD-A077169] N80-19088
Application of the concept of dynamic trim control to automatic landing of carrier aircraft — utilizing digital feedforward control [NASA-TP-1512] N80-19128
Design considerations for attaining 250-knot test velocities at the aircraft landing dynamics facility [NASA-TM-80222] N80-19132
A flight simulation investigation on the feasibility of curved approaches under MLS guidance N80-19844
Modeling and flight simulation of an active-configured aircraft under M.L.S. guidance N80-19845
Predicting field of view requirements for VSTOL aircraft approach and landing N80-19847
AIRCRAFT MAINTENANCE
Estimating the time required to transition aircraft fleets to new scheduled maintenance intervals [AD-A079606] N80-19027
AIRCRAFT MANEUVERS
Minimum time turns with thrust reversal — using control theory [AD-A078851] N80-19078
AIRCRAFT MODELS
Investigation of the airflow at rocket trajectory and wind sensor locations of a model helicopter simulating low speed flight. Application of model helicopter testing, laser velocity, and rotor wake flow visualization to investigate the aerodynamic interference at rocket trajectories and wind sensors of a helicopter operating in low speed flight [AD-A075378] N80-19039
The role of the aircraft model in avionic systems simulation N80-19837
AIRCRAFT NOISE
Methods of sound simulation and applications in flight simulators [NASA-TM-75788] N80-19133
AIRCRAFT PERFORMANCE
Parameter identification — conference on techniques applied to aircraft flight test data [AGARD-LS-104] N80-19094
Aspects of flight test instrumentation — methods to derive aircraft performance and stability and control characteristics N80-19096
Analysis of aircraft performance stability and control measures N80-19099
AIRCRAFT PRODUCTION
Fastener hole quality, volume 1 — design analysis of fatigue life and drilling techniques for fasteners in aircraft production [AD-A077859] N80-19567
AIRCRAFT RELIABILITY
Significance of large scatter of composite properties to aircraft reliability [AD-A077804] N80-19062
Preliminary Airworthiness Evaluation UH-1H helicopter equipped with Multiple Target Electronic Warfare System (MULTEWS) [AD-A078478] N80-19067
Reliability management of the avionic system of a military strike aircraft N80-19548
AIRCRAFT SAFETY
Propulsion and energetics panel Working Group 11 on aircraft fire safety. Volume 2: Main report [AGARD-AR-132-VOL-2] N80-19047
Assessment of the risk due to release of carbon fiber in civil aircraft accidents, phase 2 N80-19200
Assessment of risk due to the use of carbon fiber composites in commercial and general aviation N80-19201
AIRCRAFT STABILITY
Aircraft identification experience N80-19100
Rotorcraft identification experience N80-19101
Identification experience in extreme flight regimes N80-19102
AIRCRAFT STRUCTURES
Significance of large scatter of composite properties to aircraft reliability [AD-A077804] N80-19062
USAF damage tolerant design handbook: Guidelines for the analysis and design of damage tolerant aircraft structures, revision A [AD-A078216] N80-19065
The history of static test and Air Force structures testing [AD-A077029] N80-19136

Some recent measurements of structural dynamic damping in aircraft structures N80-19576
Damping problems in acoustic fatigue N80-19580
AIRCRAFT SURVIVABILITY
Perspective on the results N80-19202
AIRFOILS
A flight investigation of blade section aerodynamics for a helicopter main rotor having NLR-1T airfoil sections
[NASA-TM-80186] N80-19053
AIRFRAMES
Handling quality requirements for advanced aircraft design longitudinal mode
[AD-A077699] N80-19128
Primary Adhesively Bonded Structure Technology (PABST). General material property data — bonding airframes
[AD-A077891] N80-19269
AIRGLOW
Detection, ranging and diffraped measurements of equatorial ionospheric irregularities by means of airglow observations N80-19095
AIRPORTS
Nondestructive evaluation of airport pavements. Volume 2: Operational manual for PAVBEN program at TCC
[AD-A079495] N80-19130
ALASKA
LANDSAT digital analysis of the initial recovery of the Kokolik River tundra fire area, Alaska
[E80-10080] N80-19588
ALCOHOLS
Physical properties of gasoline/alcohol blends
[BERC/RI-79/4] N80-19296
ALGEBRA
Fast algorithms for solving Toeplitz system of equations and finding Rational Hermite Interpolants
[AD-A075376] N80-19901
ALGORITHMS
Calculation of the relationship between attenuation and intensity of precipitation for various polarizations
[NASA-TM-75779] N80-19705
Algorithm for calculating turbine cooling flow and the resulting decrease in turbine efficiency
[NASA-TM-81493] N80-19983
Solution of the integer concave program using the ICON algorithm, volume 1
[AD-A077842] N80-19871
Balancing the generalized eigenvalue problem
[ORNL/CSD-47] N80-19910
ALIGNMENT
Construction alignment sensor feasibility demonstrations (laser measurement) N80-19148
The effect of test system misalignment in the dynamic tension test
[NASA-CR-162829] N80-19564
ALTITUDE
Recovery system preliminary design. A simplified approach to determining staging, timing and altitude requirements for fast inflating parachutes
[AD-A077548] N80-19041
ALTITUDE CONTROL
Orbit attitude processor. STS-1 bench program verification test plan
[JSC-16386] N80-19178
ALTITUDE SICKNESS
Probability of altitude decompression disorders when breathing oxygen containing human waste gases N80-19782
ALUMINATES
Electrochemistry of solutes in chloroaluminate melts and the development of related electrochemical methodology
[AD-A078242] N80-19223
ALUMINUM
Surface treatment for aluminum bonding
[AD-A078850] N80-19254
Powder metallurgy of aluminum. Citations from the NTIS data base
[PB80-803216] N80-19259
Powder metallurgy of aluminum. Citations from the Engineering Index data base
[PB80-803224] N80-19260
ALUMINUM ALLOYS
The liquidus surface of the aluminum-titanium-boron phase diagram at the aluminum corner
[BLL-RTS-11695] N80-19235
Determination of test technique influence on K sub ISCC values for aluminum 7075-T651
[AD-A077453] N80-19242
The corrosion fatigue behavior of a high purity Al-Zn-Mg-Cu alloy
[AD-A077461] N80-19247
Corrosion of aluminum alloys in high velocity seawater
[AD-A078436] N80-19251
ALUMINUM ARSENIDES
VPE growth of (Al, Ga)As
[AD-A078264] N80-19667
ALUMINUM COMPOUNDS
Highly conducting iodinated fluoroaluminum and fluorogallium phthalocyanine polymers
[AD-A078186] N80-19273
ALUMINUM OXIDES
In vivo and in vitro aging of plasma-sprayed alumina on 316L stainless steel and Ti6Al-4V ELI substrates — prosthetic devices N80-19231
Improved impact fracture resistance in oxidation-toughened Si3n4-20 vol% ZrO2
[AD-A078833] N80-19241
AMORPHOUS MATERIALS
Development of a low loss magnetic composite utilizing amorphous metal flakes
[CONS-3205-T2] N80-19213
AMORPHOUS SEMICONDUCTORS
Preparation and characterization of hydrogenated amorphous boron thin films and thin film solar cells produced by glow discharge decomposition methods
[DOE/ET-2304-1] N80-19652
AMPLIFIER DESIGN
S-BAND MIC TRAPATT amplifier
[BLL-RTS-11984] N80-19420
AMPLITUDE MODULATION
A standard for RF modulation factor
[PB80-109085] N80-19319
ANALOGIES
Learning by understanding analogies
[AD-A078123] N80-19793
ANALYSIS (MATHEMATICS)
Methods for analysing the homogeneity of climatological series
[BLL-TRANS-1407-(9022.549)] N80-19701
ANALYSIS OF VARIANCE
Trimming the least squares estimator in the linear model by using a preliminary estimator
[AD-A078115] N80-19920
ANEMOMETERS
Low velocity performance of a high speed vane anemometer
[AD-A077457] N80-19475
ANGLE OF ATTACK
Application of the Estimation-Before-Modeling (EBM) system identification method to the high angle of attack/sideslip flight of the T-2C jet trainer aircraft. Volume 2: Simulation study using T-2C wind tunnel model data
[AD-A078923] N80-19061
Application of the Estimation-Before-Modeling (EBM) system identification method to the high angle of attack/sideslip flight of the T-2C jet trainer aircraft. Volume 3: Identification of T-2C aerodynamics stability and control characteristics from actual flight test data
[AD-A078924] N80-19072
Application of the Estimation-Before-modeling (EBM) system identification method to the high angle of attack/sideslip flight of the T-2C jet trainer aircraft. Volume 1: Executive summary
[AD-A080025] N80-19073
ANGLES (GEOMETRY)
Effect of field of view and monocular viewing on angular size judgements in an outdoor scene
[NASA-TM-81176] N80-19792
ANIONS
Photodissociation and photodetachment of atmospheric negative ions
[AD-A079091] N80-19224
ANNIHILATION REACTIONS
Testing quantum chromodynamics in electron-positron annihilation at high energies
[DOE/ER-01398-777] N80-19938
ANNUAL VARIATIONS
Calculations using a model, of the seasonal variation in the concentration of nitrogen compounds in the temperate stratosphere
[BLL-TRANS-1400-(9022.549)] N80-19700
ANODIC COATINGS
Contamination of the anode and cathode in phosphoric acid anodizing electrolytes
[AD-A077685] N80-19240
ANODIZING
Formation of porous films on titanium alloys by anodization treatments
[AD-A077676] N80-19244
ANOMALIES
A theory of anomalous absorption, backscatter and flux limitation in laser produced plasmas
[AD-A075350] N80-19958
ANTENNA ARRAYS
Pointing accuracy and dynamic range in a steered beam adaptive array
[AD-A078750] N80-19331
HF wavefront irregularities observed on a large aperture receiving array N80-19396
ANTENNA COMPONENTS
Surface Accuracy Measurement Sensor for Deployable Reflector Antennas (SAMS DRA) N80-19152
Development of electromagnetic analysis methods for large aperture antennas N80-19153
Electrostatic forming N80-19154
ANTENNA DESIGN
Large Space Systems Technology, 1979 — antenna and space platform systems conference
[NASA-CP-2116] N80-19145
Offset wasp rib concept and development N80-19146
Advanced sunflower antenna concept development — stowable reflectors N80-19147
FY-79 - LSST antenna technology development N80-19150
Development of the Maypole (Hoop/Column) deployable reflector concept for large space systems applications N80-19151
Large space system control technology status and accomplishments N80-19163
The geometry of the 37-db microwave antenna support structure
[NASA-CR-162947] N80-19321
Ground systems for HF antennas
[AD-A077691] N80-19339
The effects of stratified ground on characteristics of the inverted L antenna — current distributions, antenna radiation patterns, and impedance characteristics N80-19346
Surface fields and radiation patterns of a vertical electric dipole over a radially varying ground system N80-19348
Electrically short HF aerial systems N80-19418
ANTENNA RADIATION PATTERNS
Development of electromagnetic analysis methods for large aperture antennas N80-19153
Asymptotic high frequency techniques for UHF and above antennas — for ships
[AD-A077651] N80-19330
The effects of stratified ground on characteristics of the inverted L antenna — current distributions, antenna radiation patterns, and impedance characteristics N80-19346
The effects of re-radiation from high-rise buildings and transmission lines upon the radiation pattern of MF broadcasting antenna arrays N80-19347
Surface fields and radiation patterns of a vertical electric dipole over a radially varying ground system N80-19348
Terrain effects on log-periodic antenna characteristics using the singularity expansion method N80-19349
Theories of ground wave propagation over mixed paths N80-19350
High-frequency signal propagation and scattering in guiding channels N80-19351
Ground wave propagation over irregular, inhomogeneous terrain: Comparisons of calculations and measurements at frequencies from 121 kHz to 50 mHz N80-19352
Electrically short HF aerial systems N80-19418
Radio-link computations optimize pattern sharing of shortwave antennas N80-19419
ANTENNAS
JPL self pulsed laser surface measurement system development — large space deployed antenna structures N80-19149
Development of electromagnetic analysis methods for large aperture antennas N80-19153
Electrostatic forming N80-19154
JPL analytical performance prediction capability — for antenna systems N80-19167

ANTIBODIES
Effect of brief antiorthostatic hypokinesia on blood immunoglobulin content N80-19772
ANTISUBMARINE WARFARE AIRCRAFT
A mission training simulator for the Nimrod MR MK 2 and some aspects of the derivation and verification of its system models N80-19826
APERTURES
HF wavefront irregularities observed on a large aperture receiving array N80-19396
APPLICATIONS OF MATHEMATICS
Numerical and data analysis techniques applied to scientific research, 3
[AD-A075383] N80-19874
APPLICATIONS PROGRAMS (COMPUTERS)
Computer applications in remote sensing education N80-20013
APPROACH
Analysis of fuel-conservative curved decelerating approach trajectories for powered-lift and CTOL jet aircraft
[NASA-TP-1650] N80-19022
Flight evaluation of configuration management system concepts during transition to the landing approach for a powered-lift STOL aircraft
[NASA-TM-81146] N80-19127
APPROACH CONTROL
A flight simulation investigation on the feasibility of curved approaches under MLS guidance N80-19844
Predicting field of view requirements for VSTOL aircraft approach and landing N80-19847
AQUEOUS SOLUTIONS
Method of forming dynamic membrane on stainless steel support
[NASA-CASE-MSC-18172-1] N80-19237
ARCHITECTURE (COMPUTERS)
A fault tolerant architecture approach to avionics reliability improvement N80-19533
Security kernel design for a micro-processor-based, multilevel archival storage system
[AD-A078281] N80-19848
Distribution data base design
[EPRI-EL-1150-VOL-1] N80-19855
Distribution data base design
[EPRI-EL-1150-VOL-2] N80-19856
Distribution data base design
[EPRI-EL-1150-VOL-3] N80-19857
ARCTIC REGIONS
Research on dynamics of tundra ecosystems and their potential response to energy resource development
[DOE/SF-01525-1] N80-19842
ARGON PLASMA
Argon/UF6 plasma experiments: UF6 regeneration and product analysis
[NASA-CR-3258] N80-19935
AROMATIC COMPOUNDS
Picosecond laser studies of aromatic radical ions
[AD-A078721] N80-19219
ARRAYS
Optical channel waveguide arrays coupled to integrated charge-coupled devices and their applications
[AD-A077394] N80-19949
ARTIFICIAL INTELLIGENCE
Learning by understanding analogies
[AD-A078123] N80-19793
Dependency directed reasoning for complex program understanding
[AD-A078055] N80-19864
AMORD: A deductive procedure system
[AD-A078417] N80-19891
ARTIFICIAL SATELLITES
Photometry of artificial satellites application to the Ground Electro-Optical Deep Space Surveillance (GEODSS) program
[AD-A078675] N80-19176
Geometry, artificial satellites, and orbit determination — use of solid state cameras to determine the orbits
[AD-A077049] N80-19177
ARTILLERY
Wind tunnel tests of a spinning 105 mm artillery shell model with canard control surfaces
[AR-001-908] N80-19032
ASHES
Electrostatic precipitations for collection of high resistivity ash
[PB80-112386] N80-19671
ASPECT RATIO
Core compressor exit stage study. 1: Aerodynamic and mechanical design
[NASA-CR-159714] N80-19113
Tri-bar reading correction for oblique imagery
[AD-A078340] N80-19800
ASSAYING
Evaluation of methodology and prototype to measure atmospheric sulfuric acid
[PB80-107055] N80-19689
ASSEMBLY LANGUAGE
Using a language developed for aircraft simulators — advantages and disadvantages of using FORTRAN and assembly language N80-19831
ASTRONOMICAL PHOTOGRAPHY
Application of digital image processing techniques to astronomical imagery, 1979
[NASA-CR-162877] N80-19996
ASTROPHYSICS
Convective flows of viscous fluid in spherical layers. Certain astrophysical applications
[NASA-TM-75923] N80-19452
ASYMMETRY
An approximate finite-element method of stress analysis of non-axisymmetric bodies with elastic-plastic material behavior N80-19562
ASYMPTOTIC SERIES
Asymptotic high frequency techniques for UHF and above antennas — for ships
[AD-A077651] N80-19330
On the asymptotic distribution of U-statistics
[AD-A078117] N80-19919
On the asymptotic normality of robust regression estimates
[AD-A077886] N80-19922
ATLANTIC OCEAN
Sea surface temperature of the coastal zones of France. Heat Capacity Mapping Mission (HCMM)
[E80-10057] N80-19585
ATMOSPHERIC ATTENUATION
Calculation of the relationship between attenuation and intensity of precipitation for various polarizations
[NASA-TM-75779] N80-19705
ATMOSPHERIC BOUNDARY LAYER
Lidar measurement of boundary layer winds and convective structure
[AD-A078590] N80-19719
ATMOSPHERIC CHEMISTRY
Photodissociation and photodetachment of atmospheric negative ions
[AD-A078091] N80-19224
Mathematical models for atmospheric pollutants. Appendix B: Chemical and physical properties of gases and aerosols
[EPRI-EA-1131-APP-B] N80-19667
Nitric oxide ion and uranium oxide ion studies
[AD-A077870] N80-19688
ATMOSPHERIC CIRCULATION
On the role of the atmospheric zonal index cycle in solar/terrestrial coupling
[CONF-7905119-1] N80-19697
ATMOSPHERIC COMPOSITION
Orbit dynamics and geographical coverage capabilities of satellite-based solar occultation experiments for global monitoring of stratospheric constituents
[NASA-TP-1606] N80-19142
The long term impact of atmospheric carbon dioxide on climate
[SAN/115-136/2] N80-19740
ATMOSPHERIC DIFFUSION
Dissemination, resuspension, and filtration of carbon fibers — aircraft fires N80-19196
Large-scale fiber release and equipment exposure experiments — aircraft fires N80-19198
Surveys of facilities for the potential effects from the fallout of airborne graphite fibers N80-19199
ATMOSPHERIC EFFECTS
Ionospheric effects of a solar eclipse in the Cape Verde Islands N80-19399
ATMOSPHERIC ELECTRICITY
Atmospheric electricity and military operations
[AD-A078482] N80-19693
ATMOSPHERIC MODELS
The influence of ionospheric models on calculations of decametric wave propagation N80-19383
CLOUDS
[AD-A078363] N80-19716
A new model for sky cover
[AD-A078368] N80-19717
ATMOSPHERIC MOISTURE
Atmospheric water vapor absorption at 12 CO2 laser frequencies
[NASA-CR-162850] N80-19683
Rain attenuation over Earth-satellite paths
[AD-A075390] N80-19715
ATMOSPHERIC PRESSURE
Dynamic data assimilation by the noise freezing method
[AD-A077901] N80-19711
ATMOSPHERIC RADIATION
Possibilities of using radiation in the oxygen absorption line at lambda = 2.53 mm on slant paths for thermal sounding of the atmosphere
[BLL-TRANS-1402-(9022.549)] N80-19681
ATMOSPHERIC REFRACTION
Tropospheric refractive studies for SPADATS radar sites
[AD-A077024] N80-19338
ATMOSPHERIC TURBULENCE
Experimental pulsed laser remote crosswind measurement system. Feasibility study and design, part 5
[AD-A077631] N80-19721
ATOMIC STRUCTURE
Plans for laser hyperfine structure measurement at UNISOR
[CONF-790976-1] N80-19488
Study of the electronic surface state of 3-5 compounds — physics and chemistry of indium phosphates, gallium arsenides, and gallium antimonides
[AD-A078304] N80-19689
Determination of morphology and electronic structure in solids with 20-1000 eV radiation — technique of photon absorption and photoemission for spectroscopic analysis of materials
[LBL-9482] N80-19971
ATOMIZERS
Monodisperse atomizers for agricultural aviation applications
[NASA-CR-159777] N80-19450
ATOMIZING
Monodisperse atomizers for agricultural aviation applications
[NASA-CR-159777] N80-19450
AUDIO EQUIPMENT
COPAS: A high speed real-time digital audio processor
[BBC-RD-1979/28] N80-19485
AUGER SPECTROSCOPY
Final state correlation effects in auger lineshapes: Application to silicon dioxide
[AD-A078037] N80-19221
AURORAL ABSORPTION
Perspective on the prediction of auroral absorption N80-19390
AURORAL ZONES
Direction and Doppler characteristics of medium and long path HF signals within the night-time sub-auroral region N80-19391
AURORAS
Characteristics of the high latitude ionosphere produced by auroral particle precipitation N80-19389
Coordinated field operation of balloon-borne auroral X-ray experiment from the ATS-F satellite conjugate region
[AD-A078041] N80-19685
DMSP auroral images and the Goose Bay ionosphere
[AD-A077023] N80-19691
AUSTENITIC STAINLESS STEELS
Hydrogen effects on flow localization and fracture in type 304L stainless steel
[DP-MS-79-57] N80-19255
AUTOMATA THEORY
Toward a remotely-manned energy and production economy
[AD-A078069] N80-19804
The structure of specifications and implementations of data abstraction
[AD-A077427] N80-19850
Log diameter restricted bottom-up triangle cellular acceptors UTCA's
[AD-A077526] N80-19872
Cellular D-graph automata with augmented memory
[AD-A077389] N80-19877

Local reconfiguration of networks of processors: Arrays, trees, and graphs
[AD-A077525] N80-19886

AUTOMATIC CONTROL
Data analysis for Ocean Thermal Energy Conversion (OTEC)
[AD-A077908] N80-19838
General methods to enable robots with vision to acquire, orient and transport workpieces
[PB80-198388] N80-19828
Application of computer simulations to development of NATO E-3A automatic track initiation algorithms
N80-19827

AUTOMATIC LANDING CONTROL
Application of the concept of dynamic trim control to automatic landing of carrier aircraft — utilizing digital feedforward control
[NASA-TP-1512] N80-19126

AUTOMATIC PILOTS
NASA TLA workload analysis support. Volume 1: Detailed task scenarios for general aviation and metering and spacing studies
[NASA-CR-3199] N80-19791

AUTOMATIC TEST EQUIPMENT
Reliability investigations on an automatic test system — for an air-to-ship missile system N80-19544
Automated syringe sampler
[NASA-CASE-LAR-12308-1] N80-19684
Preliminary assessment of an automated system for detecting present weather
[AD-A078031] N80-19706

AUTOMOBILE ENGINES
Issues concerning the light-duty diesel
[DOE/EV-0050/1] N80-19610

AUTOMOBILE FUELS
Methanol as a transportation fuel: Assessment of environmental and health research
[UCRL-52697] N80-19295
Physical properties of gasoline/alcohol blends
[BERC/RI-79/4] N80-19296

AUTOMOBILES
Development of aerodynamic disturbance test procedures, volume 1: Executive summary
[PB80-108145] N80-19891
An experimental study of highway aerodynamic interference
[PB80-109866] N80-19892

AUTOTROPHS
Development of program for the control of the autotrophic component of an ecological system that is closed with regard to exchange of gases
N80-19788

AUXILIARY POWER SOURCES
Survivability of remote site alternate energy systems. Volume 1: Survivability analysis
[AD-A078118] N80-19836

AVALANCHE DIODES
S-BAND MIC TRAPATT amplifier
[BLL-RTS-11884] N80-19420

AVIONICS
Navigation systems for approach and landing of VTOL aircraft
[NASA-CR-152335] N80-19055
Dynamic Environmental Qualification Techniques
[AGARD-R-682] N80-19090
Application of MIL-STD-810C dynamic requirements to USAF avionics procurements N80-19091
Civil aircraft equipment environment qualification techniques N80-19093
Avionics interface data summaries: A-10A, EF-111A, F-4S, F-4Q, F-15A, F-16A, F-111A, F-111E, F-111F, RF-4C
[AD-A077386] N80-19105
Flat bus fault sensors
[AD-A077060] N80-19435
Avionics Reliability, Its Techniques and Related Disciplines — conferences
[AGARD-CP-261] N80-19519
An analysis of the evolution of the reliability and maintainability disciplines N80-19520
Difficulties in predicting avionics reliability
N80-19521
Reliability growth models N80-19522
A simulation program for the determination of system reliability of complex avionic systems N80-19523
A fault tolerant architecture approach to avionics reliability improvement N80-19533
Trends in reliability modeling technology for fault tolerant systems N80-19534
Nonelectronic aspects of avionic system reliability — actuation N80-19535
Impacts of technologies selected on the reliability and operational availability of equipments. Cost considerations N80-19536
A new approach to maintainability prediction — avionics, ground, and shipboard electronics
N80-19537
Reliability growth through environmental simulation — electronic equipment N80-19538
The A-7 head-up display reliability programme
N80-19539
Reliability management of the avionic system of a military strike aircraft N80-19546
Formal methods for achieving reliable software
N80-19549
Software development for TORNADO: A case history from the reliability and maintainability aspect
N80-19554
Modeling and Simulation of Avionics Systems and Command, Control and Communications systems — conferences
[AGARD-CP-266] N80-19809
Verification and validation of avionic simulations
N80-19814
E-3A navigational computer system real-time environmental simulator N80-19824
A mission training simulator for the Nimrod MR MK 2 and some aspects of the derivation and verification of its system models N80-19825
The role of the aircraft model in avionic systems simulation N80-19837
Avionics evaluation program: Simulation models for the effectiveness analysis of avionics N80-19838
Simulation for whole life development N80-19839
A simulation support system, the development tool for avionic systems and subsystems N80-19840
Fire control for air-to-air gunnery in high performance fighter aircraft N80-19841
Simulation for integration with dynamic tests of the logical elements of principal onboard computers
N80-19842
Cruise-missile-carrier navigation requirements
N80-19843
Modeling the human operator: Applications to system cost effectiveness N80-19846

AWACS AIRCRAFT
Application of computer simulations to development of NATO E-3A automatic track initiation algorithms
N80-19827

AXIAL FLOW
Aerodynamic and acoustic investigations of axial flow fan and compressor blade rows, including three-dimensional effects
[AD-A077712] N80-19116

AXIAL FLOW TURBINES
Algorithm for calculating turbine cooling flow and the resulting decrease in turbine efficiency
[NASA-TM-81453] N80-19983

AZIMUTH
Azimuth beamwidth effect on radar sensed terrain horizon profiles N80-19362
An experimental investigation of multi-path scattering at L-band N80-19370

B

B-1 AIRCRAFT
Solid state power controller verification studies
[AD-A078238] N80-19429

B-52 AIRCRAFT
Developing, mechanizing and testing of a digital active flutter suppression system for a modified B-52 wind-tunnel model
[NASA-CR-159155] N80-19566

BACKGROUND RADIATION
Background Optical Suppression System (BOSS)
[AD-A077871] N80-19945
Characteristics of the background emission spectrum from a miniature ICP
[AD-A077876] N80-19955

BACTERIA
A biological waste water monitor study using differential laser light scattering from bacteria
[AD-A078527] N80-19665

BALL BEARINGS
Establishment of engineering design data for hybrid steel/ceramic ball bearings
[AD-A078934] N80-19509

BALLISTICS
Fire control for air-to-air gunnery in high performance fighter aircraft N80-19841

BALLOON SOUNDING
Balloon systems and launch support
[AD-A075385] N80-19037
Sounding rocket and balloon systems support
[AD-A075384] N80-19038

BALLOON-BORNE INSTRUMENTS
Coordinated field operation of balloon-borne auroral X-ray experiment from the ATS-F satellite conjugate region
[AD-A078041] N80-19685

BAND STRUCTURE OF SOLIDS
Determinations of electronic states in crystalline semiconductors and metals by angle-resolved photoemission
[LBL-9429] N80-19972

BANDPASS FILTERS
An active filter primer
[AD-A078847] N80-19439

BASE FLOW
Free-flight base pressure measurements on 8 deg cones
[AD-A075365] N80-19036

BASE PRESSURE
Free-flight base pressure measurements on 8 deg cones
[AD-A075365] N80-19036

BATCH PROCESSING
Performance collapse due to overhead in a simple, single-server queueing system
[AD-A078190] N80-19888

BATHS
Mechanical properties of electroplated nickel rings for bath aging study
[BDX-613-2303] N80-19256

BAYES THEOREM
Bayesian Interactive Graphics Reliability Assessment Procedure (BIGRAP)
[AD-A077641] N80-19878

BAYS (TOPOGRAPHIC FEATURES)
Sea surface temperature of the coastal zones of France. Heat Capacity Mapping Mission (HCMM)
[E80-10057] N80-19585

BEAM WAVEGUIDES
Pointing accuracy and dynamic range in a steered beam adaptive array
[AD-A078750] N80-19331

BEAMS (RADIATION)
Development of quasi-homogeneous optical sources
[AD-A079297] N80-19952

BEARING
Evaluation of SRM flex bearing materials and processes
[NASA-TM-78266] N80-19264

BEARING (DIRECTION)
A system for using radar to record wave direction
[AD-A076307] N80-19342
An experimental investigation of multi-path scattering at L-band N80-19370

BEARINGS
Equilibrium temperatures in self-contained bearing assemblies. Part 5: Examples of the complete method — method of estimating the temperature rise in a bearing assembly
[ESDU-79002] N80-19493

BEHAVIOR
Effect of habituation on the susceptibility of the rat to restraint ulcers
[NASA-TM-76072] N80-19748

BERYLLIUM
Characteristics of mechanically fastened joints of CIP/HIP-1 Beryllium
[AD-A078275] N80-19500

BESSEL FUNCTIONS
Power series for the calculation of Bessel functions for large arguments, provides J sub nu (x) and y sub nu (x), accurate to at least 14 places
[AD-A077899] N80-19898

BIBLIOGRAPHIES
Aeronautical engineering: A continuing bibliography with indexes (supplement 119)
[NASA-SP-7037(119)] N80-19021
Military aircraft and missile technology at the Langley Research Center: A selected bibliography
[NASA-TM-80204] N80-19024

Remotely piloted vehicles, volume 2. A bibliography with abstracts
[PB80-802119] N80-19080
Biotelemetry, volume 2. Citations from the Engineering Index data base — bibliographies
[PB80-802101] N80-19181
Biotelemetry. Citations from the NTIS data base
[PB80-802093] N80-19182
Stress corrosion of stainless steels, volume 2. Citations from the Engineering Index data base
[PB80-803208] N80-19257
Stress corrosion of stainless steels, volume 2. Citations from the NTIS data base
[PB80-803190] N80-19256
Powder metallurgy of aluminum. Citations from the NTIS data base
[PB80-803216] N80-19259
Powder metallurgy of aluminum. Citations from the Engineering Index data base
[PB80-803224] N80-19260
Carbon monoxide lasers. Citations from the NTIS data base — bibliographies
[PB80-803133] N80-19490
Carbon monoxide lasers, volume 2. Citations from the Engineering Index data base — bibliographies
[PB80-803141] N80-19491
Thrust, sleeve and jewel bearings, volume 2. Citations from the Engineering Index data base — bibliographies
[PB80-802630] N80-19511
Thrust, sleeve and jewel bearings. Citations from the NTIS data base — bibliographies
[PB80-802622] N80-19512
Solar electric power generation, volume 3. Citations from the Engineering Index data base
[PB80-803034] N80-19657
Solar electric power generation, volume 2. Citations from the NTIS data base
[PB80-803000] N80-19658
Solar electric power generation, volume 3. Citations from the NTIS data base
[PB80-803018] N80-19659
Solar electric power generation, volume 2. Citations from the Engineering Index data base
[PB80-803026] N80-19660
Solar sea power plants. Citations from the NTIS data base
[PB80-802580] N80-19661
Solar seapower plants. Citations from the Engineering Index data base
[PB80-802598] N80-19662
Weather modification effects and management. A bibliography with abstracts
[PB80-802796] N80-19744
Aerospace medicine and biology: A continuing bibliography with indexes, supplement 203
[NASA-SP-7011(203)] N80-19779
Aerospace medicine and biology: A continuing bibliography with indexes, supplement 204
[NASA-SP-7011(204)] N80-19781
Biofeedback. A bibliography with abstracts
[PB80-803117] N80-19790
Stress factors on pilot performance. A bibliography with abstracts
[PB80-803075] N80-19794
Human work measurement. A bibliography with abstracts
[PB80-803186] N80-19807
Random access memories. Citations from the NTIS data base
[PB80-802333] N80-19858
Random access memories, volume 1. Citations from the Engineering Index data base
[PB80-802341] N80-19859
Random access memories, volume 2. Citations from the Engineering Index data base
[PB80-802358] N80-19860
Natural language processing, volume 1. Citations from the NTIS data base
[PB80-803281] N80-19883
Natural language processing, volume 2. Citations from the NTIS data base
[PB80-803299] N80-19884
Natural language processing. Citations from the Engineering Index data base
[PB80-803307] N80-19885
Integration of nonlinear differential equations. A bibliography with abstracts
[PB80-802978] N80-19912
Josephson junctions. Citations from the NTIS data base
[PB80-802655] N80-19975
Josephson junctions, volume 2. Citations from the Engineering Index data base
[PB80-802663] N80-19976
Textbooks and technical references for remote sensing N80-20014

BINDING
Prospects for broadening the range of inorganic binding agents
[RTS-11804] N80-19218

BIOASSAY
A biological waste water monitor study using differential laser light scattering from bacteria
[AD-A078527] N80-19985

BIOASTRONAUTICS
Blood circulation under conditions of weightlessness
[NASA-TM-76036] N80-19786

BIOINSTRUMENTATION
A device for determining the intensity of partial sweating
[NASA-TM-75429] N80-19801

BIOLOGICAL EFFECTS
Methanol as a transportation fuel: Assessment of environmental and health research
[UCRL-52687] N80-19295
Brunsau Known Geothermal Resource Area: An environmental analysis
[EGG-GTH-5004] N80-19602
USSR report: Space biology and aerospace medicine, v. 14, no.1
[JPRS-75251] N80-19755
Reaction of human blood to chronic exposure to low doses of carbon monoxide in a confined environment N80-19761
Functional changes in the adrenal cortex during simulation of stress situations in the presence of high carbon monoxide levels N80-19774
Effect of hypoxia and hypercapnia on lactate and pyruvate levels in rat blood and myocardium N80-19775
Study of radioprotective effect of high-intensity magnetic fields on mammalian cell cultures N80-19776
Studies of the effects of stationary magnetic fields on rat erythron N80-19777
Aerospace medicine and biology: A continuing bibliography with indexes, supplement 203
[NASA-SP-7011(203)] N80-19779
Aerospace medicine and biology: A continuing bibliography with indexes, supplement 204
[NASA-SP-7011(204)] N80-19781
The Thousand Aviator study: 1969 - 1971 follow-up program with distributions and intercorrelations of selected variables
[AD-A079700] N80-19789

BIOMASS
A critical comparison of remote sensing and other methods for nondestructive estimation of standing crop biomass
[E80-10082] N80-19590
Use of remote sensing for land use policy formulation — Kalamazoo, Lake, Mecosta, Newaygo, Osceola, and Wexford counties, Michigan
[E80-10085] N80-19592

BIOMASS ENERGY PRODUCTION
Potential of biomass conversion in meeting the energy needs of the rural populations of developing countries: An overview
[BNL-26721] N80-19294
Environmental and economic evaluations of energy recovery from agricultural and forestry residues
[ANL/EES/TM-58] N80-19668

BIOMEDICAL DATA
The Thousand Aviator study: 1969 - 1971 follow-up program with distributions and intercorrelations of selected variables
[AD-A079700] N80-19789

BIOSPHERE
Stability analysis of kinetic models of the global C-cycle: Exchange of carbon between land biota and atmosphere under the influence of man
[BLL-TRANS-1421-(9022.549)] N80-19702

BIOTELEMETRY
Biotelemetry, volume 2. Citations from the Engineering Index data base — bibliographies
[PB80-802101] N80-19181
Biotelemetry. Citations from the NTIS data base
[PB80-802093] N80-19182

BIT SYNCHRONIZATION
Critique of a Hughes shuttle Ku-band data sampler/bit synchronizer
[NASA-CR-160556] N80-19427

BLOOD
Effects of flights differing in duration on protein composition of cosmonauts blood N80-19757
Reaction of human blood to chronic exposure to low doses of carbon monoxide in a confined environment N80-19761
Effect of hyperoxia on oxygen transport properties of blood N80-19763
External respiration and acid-base balance of human blood during long-term antiorthostatic hypokinesia and in the recovery period N80-19764
Effect of brief antiorthostatic hypokinesia on blood immunoglobulin content N80-19772
Effect of hypoxia and hypercapnia on lactate and pyruvate levels in rat blood and myocardium N80-19775

BLOOD CIRCULATION
Studies of the effects of stationary magnetic fields on rat erythron N80-19777
Effect of hypokinesia on cardiac contractile function and nervous regulation of the heart
[NASA-TM-75970] N80-19783
Blood circulation under conditions of weightlessness
[NASA-TM-76036] N80-19786

BLOOD FLOW
Ultrasonic Doppler directional blood flow velocity meter
[RAE-LIB-TRANS-1918] N80-19780

BLOOD PLASMA
Rat plasma and tissue lipids after a long-term space flight N80-19773

BLOWING
Influence of roughness and blowing on compressible turbulent boundary layer flow — skin friction drag
[AD-A077642] N80-19461

BLUNT BODIES
Application of a numerically generated orthogonal coordinate system to the solution of inviscid axisymmetric supersonic flow over blunt bodies
[NASA-TP-1619] N80-19031

BODY-WING CONFIGURATIONS
Experimental investigation of a circulation control aileron
[AD-A078825] N80-19046

BONE MINERAL CONTENT
State of the mineral component of rat bone tissue during hypokinesia and the recovery period
[NASA-TM-76059] N80-19753

BORON
Preparation and characterization of hydrogenated amorphous boron thin films and thin film solar cells produced by glow discharge decomposition methods
[DOE/ET-2304-1] N80-19652

BORON ALLOYS
The liquidus surface of the aluminum-titanium-boron phase diagram at the aluminum corner
[BLL-RTS-11695] N80-19235

BOUNDARY LAYER CONTROL
Experimental investigation of a circulation control aileron
[AD-A078825] N80-19046

BOUNDARY LAYER FLOW
Outline of research on oscillating boundary layers
[NASA-TM-75806] N80-19453
The calculation of momentum and heat transfer in internal flows and in flows with small regions of separation
[AD-A078484] N80-19458
Influence of roughness and blowing on compressible turbulent boundary layer flow — skin friction drag
[AD-A077642] N80-19461

BOUNDARY LAYER TRANSITION
Wall pressure fluctuations during transition on a flat plate
[AD-A075379] N80-19035

BOUNDARY VALUE PROBLEMS
An evaluation of the two-parameter momentum-integral laminar boundary layer calculation method of head
[AD-A077325] N80-19456

The calculation of momentum and heat transfer in internal flows and in flows with small regions of separation
[AD-A078484] N80-19458
Global bounds and approximations for nonlinear diffusion problems
[AD-A078343] N80-19907
Sequential gradient-restoration algorithm for optimal control problems with general boundary conditions N80-19887
Special function solutions of the diffusion equation
[AD-A075324] N80-19899
One-sided continuous dependence of maximal solutions — Caratheodory condition
[AD-A079722] N80-19906

BRAKES (FOR ARRESTING MOTION)
Transient thermal effects in disc brakes
[AD-A078735] N80-19905

BRAZIL
Coastal water temperature in the southeastern portion of Brazil utilizing oceanographic data and NOAA sensor data, volume 2
[INPE-1599-RPE/070-VOL-2] N80-19745

BRIGHTNESS
Visible flux variations across finite clouds — satellite images N80-19899

BRILLOUIN EFFECT
A theory of anomalous absorption, backscatter and flux limitation in laser produced plasmas
[AD-A075350] N80-19906

BUBBLES
Transequatorial propagation through equatorial plasma bubbles: Discrete events N80-19393

BURNING RATE
An analysis of turbulent diffusion flame in axisymmetric jet
[NASA-CR-162884] N80-19449

BUS CONDUCTORS
Flat bus fault sensors
[AD-A077080] N80-19435

C

C-141 AIRCRAFT
Aerodynamic investigation of C-141 leading edge modification for cruise drag reduction, volume 2
[AD-A077696] N80-19081

CADMIUM
Sources of atmospheric cadmium
[PB80-121221] N80-19877

CADMIUM SULFIDES
Cadmium sulfide solar cells, volume 1. Citations from the NTIS data base
[PB80-802219] N80-19856

CADMIUM TELLURIDES
Characterization of LPE grown HgCdTe by ion scattering spectrometry
[AD-A077984] N80-19866

CALCIUM METABOLISM
Effectiveness of using thyrocalcitonin for the prevention of a calcium metabolic disorder in the mineralized tissues of rabbits with 30 days hypokinesia
[NASA-TM-75957] N80-19751

CALCULATORS
TI-59 magnetic card calculator solutions to composite materials formulas
[AD-A079043] N80-19208

CALCULUS OF VARIATIONS
Dynamic data assimilation by the noise freezing method
[AD-A077901] N80-19711

CALIFORNIA
Regional systems development for geothermal energy resources. Pacific region: California and Hawaii. Task 1: Implementation plan development — for the generation of electric power
[DOE/ET-28432-1] N80-19804
Regional systems development for geothermal energy resources. Pacific region: California and Hawaii. Task 2: Regional program monitoring and progress evaluation — for the generation of electric power
[DOE/ET-28432-2] N80-19805
Regional systems development for geothermal energy resources. Pacific region: California and Hawaii. Task 3: Water resources evaluation — for generation of electric power
[DOE/ET-28432-3/1] N80-19806
Regional systems development for geothermal energy resources. Pacific region: (California and Hawaii). Task 3: Water resources evaluation, appendices — for generation of electric power
[DOE/ET-28432-3/2] N80-19807

CAMERAS
Geometry, artificial satellites, and orbit determination — use of solid state cameras to determine the orbits
[AD-A077049] N80-19177
The pointable multispectral linear array system and the large format camera for early 1980 shuttle payloads N80-20015

CAMOUFLAGE
Helicopter pilot detection of the two different camouflaged hawk batteries
[AD-A077954] N80-19803

CANADA
Feasibility study on a Canadian civil SAR plan for search and rescue duties
[AD-A075382] N80-19050

CANONICAL FORMS
On the problems of construction and statistical inference associated with a generalization of canonical variables N80-19895

CANOPIES
A study of the canopy design for the advanced attack helicopter by use of computer graphics
[AD-A078291] N80-19069

CANS
Stress analysis of high-level waste canisters: Methods, applications, and design data
[PNL-3036] N80-19939

CAPILLARY FLOW
Capillary acquisition devices for high-performance vehicles: Executive summary — evaluation of cryogenic propellant management techniques using the centaur launch vehicle
[NASA-CR-159658] N80-19185

CAPILLARY TUBES
Capillary acquisition devices for high-performance vehicles: Executive summary — evaluation of cryogenic propellant management techniques using the centaur launch vehicle
[NASA-CR-159658] N80-19185

CARBON
Stability analysis of kinetic models of the global C-cycle: Exchange of carbon between land biota and atmosphere under the influence of man
[BLL-TRANS-1421-(9022.549)] N80-19702

CARBON DIOXIDE
Dissociative and double photoionization of CO2 from threshold to 90 A
[NASA-CR-162844] N80-19929

CARBON DIOXIDE CONCENTRATION
The long term impact of atmospheric carbon dioxide on climate
[SAN/115-136/2] N80-19740

CARBON DIOXIDE LASERS
Atmospheric water vapor absorption at 12 CO2 laser frequencies
[NASA-CR-162850] N80-19883

CARBON FIBERS
Data reduction and analysis of graphite fiber release experiments
[NASA-CR-159032] N80-19048
Assessment of Carbon Fiber Electrical Effects
[NASA-CP-2119] N80-19193
Approach to the assessment of the hazard — fire released carbon fiber electrical effects N80-19194
Release of carbon fibers from burning composites N80-19195
Dissemination, resuspension, and filtration of carbon fibers — aircraft fires N80-19196
Evaluation of equipment vulnerability and potential shock hazards — carbon fibers N80-19197
Large-scale fiber release and equipment exposure experiments — aircraft fires N80-19198
Surveys of facilities for the potential effects from the fallout of airborne graphite fibers N80-19199
Assessment of the risk due to release of carbon fiber in civil aircraft accidents, phase 2 N80-19200
Assessment of risk due to the use of carbon fiber composites in commercial and general aviation N80-19201
Perspective on the results N80-19202
Effects of carbon/graphite fiber contamination on high voltage electrical insulation N80-19203
Effects of carbon fibers on consumer products N80-19204
Risk assessment of carbon fiber composite in surface transportation N80-19205
Electromagnetic shielding of structural foams by using internal conductive materials
[AD-A078718] N80-19329

CARBON MONOXIDE
Reaction of human blood to chronic exposure to low doses of carbon monoxide in a confined environment N80-19781
Functional changes in the adrenal cortex during simulation of stress situations in the presence of high carbon monoxide levels N80-19774

CARBON MONOXIDE LASERS
Carbon monoxide lasers. Citations from the NTIS data base — bibliographies
[PB80-803130] N80-19490
Carbon monoxide lasers, volume 2. Citations from the Engineering Index data base — bibliographies
[PB80-803141] N80-19491

CARBON STEELS
Gas phase hydrogen permeation in alpha titanium and carbon steels
[NASA-CR-3190] N80-19236

CARDIOVASCULAR SYSTEM
Cardiovascular reaction to periodic head-pelvis accelerations on a short-arm centrifuge N80-19760

CARRIER FREQUENCIES
Synchronization of the radio-4 (UK) transmitter chain on 200 kHz — examination of the means by which the carriers of three transmitters are phase locked
[BBC-RD-1979/27] N80-19317

CAST ALLOYS
Structure and properties of cast alloys
[AD-A077430] N80-19246

CATALYSIS
Experimental assessment of nitrogen oxides transformations while sampling combustion products
[AD-A078090] N80-19220
Activation by means of colloidal palladium in the electroplating of ABS copolymers. 2: The nature of the palladium/tin (2) chloride activating solution
[BLL-RTS-11924] N80-19261
Hydrogen and methane syntheses through radiation catalysis N80-19297

CATALYSTS
Methanol and methyl fuel catalysts
[FE-3177-4] N80-19302

CATALYTIC ACTIVITY
Solid state, surface and catalytic properties of oxides
[COO-4987-1] N80-19674

CATHODE RAY TUBES
Reliability of high-brightness CRTs for airborne displays N80-19543

CATHODES
Characterization of tungsten dispenser cathodes using ISS and SIMS
[AD-A077582] N80-19428

CEILINGS (METEOROLOGY)
Some models for ceiling
[AD-A078033] N80-19707

CELESTIAL SPHERE
Convective flows of viscous fluid in spherical layers. Certain astrophysical applications
[NASA-TM-75923] N80-19452

CELLS (BIOLOGY)
Kidney cell electrophoresis
[NASA-CR-160555] N80-19782

CENTAUR LAUNCH VEHICLE
Capillary acquisition devices for high-performance vehicles: Executive summary — evaluation of cryogenic propellant management techniques using the centaur launch vehicle
[NASA-CR-159658] N80-19185

CENTRAL PROCESSING UNITS
COPAS: A high speed real-time digital audio processor
[BBC-RD-1979/26] N80-19465

CENTRIFUGAL COMPRESSORS
On the characteristics of centrifugal-reciprocating machines — cryogenic coolers
[NASA-CR-162981] N80-19499

CENTRIFUGAL FORCE
Centrifugal fluidized combustion of coal
[FE-2516-9] N80-19293

CENTRIFUGING STRESS
Cardiovascular reaction to periodic head-pelvis accelerations on a short-arm centrifuge N80-19760

CERAMICS
Novel ceramic turbine rotor concepts
[AD-A078989] N80-19118
Failure causing defects in ceramics: What NDE should find
[AD-A078234] N80-19267
Machining flaws and the strength grain size behavior of ceramics
[AD-A077536] N80-19277
Establishment of engineering design data for hybrid steel/ceramic ball bearings
[AD-A078934] N80-19509
CHANNELS (DATA TRANSMISSION)
Channel measurement for wideband digital communication over fading channels N80-19315
Forecast analysis of optical waveguide bus performance
[NASA-CR-162951] N80-19942
CHARGE COUPLED DEVICES
Analog binary programmable transversal filter
[AD-A078880] N80-19437
Binary/analog CCD correlator development
[AD-A077572] N80-19849
Optical channel waveguide arrays coupled to integrated charge-coupled devices and their applications
[AD-A077394] N80-19949
CHARGED PARTICLES
Fog dispersion — charged particle technique
[NASA-CR-3255] N80-19703
CHECKOUT
Installation and checkout of the DOE/NASA Mod-1 2000-kW wind turbine generator
[NASA-TM-81444] N80-19614
CHEMICAL ANALYSIS
Water quality monitor — spacecraft potable water
[NASA-CR-160412] N80-19663
Evaluation of methodology and prototype to measure atmospheric sulfuric acid
[PB80-107055] N80-19669
CHEMICAL BONDS
Ways to inorganic polymers
[BLL-RTS-11805] N80-19262
Effect of number of chemical bonds on the strength of adhesion between glass and polybutadiene
[AD-A078237] N80-19274
CHEMICAL CLOUDS
Augmentation of HF propagation — using chemical ion clouds N80-19379
CHEMICAL COMPOSITION
Surface chemical composition - depth profile of polyether polyurethaneurea as studied by FT-IR and ESCA
[AD-A078240] N80-19272
CHEMICAL ENERGY
Electrolysis-based hydrogen storage systems overview and rationale of the Brookhaven National Laboratory managed program
[BNL-26904] N80-19654
CHEMICAL ENGINEERING
Mixing and gasification of coal in entraining flow systems
[FE-2666-T1] N80-19303
CHEMICAL LASERS
An efficient rotational nonequilibrium model of a cw chemical laser
[AD-A078485] N80-19487
CHEMICAL PROPERTIES
Mathematical models for atmospheric pollutants. Appendix B: Chemical and physical properties of gases and aerosols
[EPRI-EA-1131-APP-B] N80-19667
CHEMICAL REACTIONS
Formation of organosilicon compounds. 58: Synthesis of a carbosilane with propellane structure
[RAE-LIB-TRANS-2029] N80-19265
Investigation of thermoplastic elastomers as propellant binders
[AD-A078691] N80-19286
Chemically pumped iodine laser — based on the chemical production of oxygen
[AD-A078919] N80-19485
CHEMICAL REACTORS
Environmental assessment of the HYGAS process. Volume 1: HYGAS environmental characterization, data synthesis, analysis, and interpretation, tests 37 - 84
[FE-2433-25-VOL-1] N80-19305
Systems studies of coal conversion processes using a reference simulator
[FE-2275-11] N80-19307
Synthesis gas demonstration plant program, phase 1
[FE-257706] N80-19308
CHEMILUMINESCENCE
Mobile source NOx monitor, hydrogen-atom direct chemiluminescence method
[PB80-102799] N80-19670
CHIPS (ELECTRONICS)
Program to design, develops, fabricate and deliver thin film chip inductors suitable for hybrid circuit applications
[AD-A078940] N80-19432
Injection laser waveguide coupler
[AD-A077030] N80-19484
Binary/analog CCD correlator development
[AD-A077572] N80-19849
CHLORINE COMPOUNDS
Electrochemistry of solutes in chloroaluminate melts and the development of related electrochemical methodology
[AD-A078242] N80-19223
CHROMOSOMES
Effects of 25 and 50 MeV protons on human peripheral blood lymphocyte chromosomes in vitro N80-19767
CIRCUIT BOARDS
Viscoelastic polymer for printed-circuit-board vibration damping
[AD-A077803] N80-19275
CIRCUIT PROTECTION
Flat bus fault sensors
[AD-A077060] N80-19435
CIRCUIT RELIABILITY
Reliability assurance for large scale integrated circuits N80-19542
CIRCULATION
Experimental investigation of a circulation control aileron
[AD-A078825] N80-19046
CIRRUS CLOUDS
Cirrus particle distribution study, part 5
[AD-A077361] N80-19741
CITIES
Remote sensing applications to resource problems in South Dakota — Chamberlain, Rapid City, Watertown; Spink County; Lake Herman and Six-Mile Creek Watersheds; and Missouri River waterfowl
[E80-10086] N80-19583
CIVIL AVIATION
Propulsion and energetics panel Working Group 11 on aircraft fire safety. Volume 2: Main report
[AGARD-AR-132-VOL-2] N80-19047
Feasibility study on a Canadian civil CAR plan for search and rescue duties
[AD-A075392] N80-19050
Structures in aeronautical phraseology: From English to Spanish N80-19978
CLIMATE
Guide to standard weather summaries and climatic services
[AD-A078660] N80-19706
Some models for visibility
[AD-A075490] N80-19950
CLIMATOLOGY
Methods for analysing the homogeneity of climatological series
[BLL-TRANS-1407-(9022.549)] N80-19701
Atlas of Naval operational environments: The natural marine environment
[AD-A077033] N80-19723
The long term impact of atmospheric carbon dioxide on climate
[SAN/115-136/2] N80-19740
CLINICAL MEDICINE
Design of a program for expert diagnosis of acid base and electrolyte disturbances
[AD-A078413] N80-19226
CLOSED ECOLOGICAL SYSTEMS
Development of program for the control of the autotrophic component of an ecological system that is closed with regard to exchange of gases N80-19768
CLOUD COVER
Multispectral cloud identification study
[AD-A077873] N80-19710
CLOUDS
[AD-A078363] N80-19716
A new model for sky cover
[AD-A078368] N80-19717
CLOUD HEIGHT INDICATORS
The visioceilometer: A portable cloud height and visibility indicator
[AD-A078332] N80-19713
CLOUD PHOTOGRAPHY
Satellite training course notes. Part 4: Cloud patterns and the upper air wing field
[AD-A077957] N80-19712
CLOUD PHYSICS
SMMR simulator radiative transfer calibration model. 1: Derivation
[E80-10091] N80-19589
Cirrus particle distribution study, part 5
[AD-A077361] N80-19741
CLOUDS (METEOROLOGY)
Visible flux variations across finite clouds — satellite images N80-19699
Analyze, calculate, and develop techniques for weather satellite imagery data
[AD-A077292] N80-19735
COAL
Centrifugal fluidized combustion of coal
[FE-2516-9] N80-19293
Cogeneration Technology Alternatives Study (CTAS). Volume 1: Summary
[NASA-TM-81400] N80-19625
Analysis of thermal decomposition products of flue gas conditioning agents
[PB80-111818] N80-19672
COAL GASIFICATION
The chemistry of sulfur in char and the implications for hydrogasification/hydrodesulfurization
[FE-2449-9] N80-19298
Coal processing fuel cell utilization. Task 8: H2S removal by calcium-based sorbents
[PSI-TR-167] N80-19300
Mixing and gasification of coal in entraining flow systems
[FE-2666-T1] N80-19303
Environmental assessment of the HYGAS process. Volume 1: HYGAS environmental characterization, data synthesis, analysis, and interpretation, tests 37 - 84
[FE-2433-25-VOL-1] N80-19305
Development of a fast fluid bed gasifier, task 2 and 3
[FE-2361-40] N80-19306
Systems studies of coal conversion processes using a reference simulator
[FE-2275-11] N80-19307
Synthesis gas demonstration plant program, phase 1
[FE-257706] N80-19308
Pollutants from synthetic fuels production: Sampling and analysis methods for coal gasification
[PB80-104656] N80-19309
Application of coke plant control technologies to coal conversion
[PB80-108954] N80-19310
Screening evaluation of electric power cycles integrated with coal gasification plants
[EPRI-AF-1180] N80-19648
COAL LIQUEFACTION
Fluid coking of coal liquefaction residues: The fourth residue
[FE-2422-28] N80-19304
Application of coke plant control technologies to coal conversion
[PB80-108954] N80-19310
Engineering evaluation of control technology for H-Coal and Exxon donor solvent processes
[PB80-108586] N80-19678
COASTAL WATER
Sea surface temperature of the coastal zones of France. Heat Capacity Mapping Mission (HCMM)
[E80-10057] N80-19585
Coastal water temperature in the southeastern portion of Brazil utilizing oceanographic data and NOAA sensor data, volume 2
[INPE-1589-RPE/070-VOL-2] N80-19745
COAXIAL CABLES
Principles of HF communication in tunnels using open transmission lines and leaky cables N80-19405
Leaky coaxial cables for obstacle detection and continuous access guided communications N80-19407

Mode conversion by tunnel non-uniformities in leaky feeder communication systems N80-19413

COCKPITS

Crew station design facility feasibility study [AD-A078134] N80-19084

CODING

The RADOT code system to calculate the radar return from a forested area [AD-A078471] N80-19333

Interframe adaptive data compression techniques for images [AD-A078841] N80-19873

COGENERATION

Cogeneration Technology Alternatives Study (CTAS). Volume 1: Summary [NASA-TM-81400] N80-19626

COGNITIVE PSYCHOLOGY

Constructions in geometry problem solving [AD-A078338] N80-19804

Theory of constructions and set in problem solving [AD-A078339] N80-19805

COHERENT RADIATION

Development of quasi-homogeneous optical sources [AD-A078297] N80-19952

COKE

Fluid coking of coal liquefaction residues: The fourth residue [FE-2422-28] N80-19304

Application of coke plant control technologies to coal conversion [PB80-108954] N80-19310

COLD CATHODE TUBES

Plasma cathode thyratron [AD-A078894] N80-19431

COLLOIDS

Activation by means of colloidal palladium in the electroplating of ABS copolymers. 2: The nature of the palladium/tin (2) chloride activating solution [BLL-RTS-11824] N80-19261

COLOR

Color ink-jet demonstration program [AD-A075377] N80-19476

Development and usage of a false color display technique for presenting Seasat-A scatterometer data [NASA-CR-159203] N80-19862

COMBAT

Avionics evaluation program: Simulation models for the effectiveness analysis of avionics N80-19836

COMBUSTION

Turbulence, combustion, pollutant, and stability characterization of a premixed, step combustor [NASA-CR-3230] N80-19108

COMBUSTION CHAMBERS

Evaluation of fuel character effects on J79 engine combustion system [AD-A078440] N80-19119

COMBUSTION EFFICIENCY

Fuel quality combustion analysis [NASA-CR-162822] N80-19284

COMBUSTION PHYSICS

Evaluation of a locally homogeneous flow model of spray combustion [NASA-CR-3202] N80-19283

COMBUSTION PRODUCTS

Data reduction and analysis of graphite fiber release experiments [NASA-CR-159032] N80-19048

Experimental assessment of nitrogen oxides transformations while sampling combustion products [AD-A078080] N80-19220

Fuel quality combustion analysis [NASA-CR-162822] N80-19284

The chemistry of sulfur in char and the implications for hydrogasification/hydrodesulfurization [FE-2449-9] N80-19298

Analysis of thermal decomposition products of flue gas conditioning agents [PB80-111818] N80-19672

COMFORT

Human comfort response to random motions with combined yawing and rolling motions [NASA-CR-159187] N80-19802

COMMAND AND CONTROL

Modeling and Simulation of Avionics Systems and Command, Control and Communications systems — conferences [AGARD-CP-268] N80-19809

Representing human thought and response in military conflict simulation models N80-19813

Objectives for building an experimental CCIS N80-19815

Simulation of overall air defense command and control N80-19816

Theater air defense engagement simulation-command/control/communications re-C3I: An approach to theater air defense model/methodology development N80-19817

Design and simulation of a C3 system for surveillance purpose N80-19821

Simulation for whole life development N80-19839

COMMERCIAL AIRCRAFT

Assessment of risk due to the use of carbon fiber composites in commercial and general aviation N80-19201

COMMUNICATION

The levels of edit, second edition [NASA-CR-162980] N80-19983

COMMUNICATION NETWORKS

Computerized models for design and analysis of computer communications systems [AD-A078022] N80-19324

Radio network and radio link surveys derived by computer from a terrain data base N80-19365

Design and simulation of a C3 system for surveillance purpose N80-19821

COMMUNICATION SATELLITES

Simulation program of nonlinearities applied to telecommunication systems [NASA-TM-75511] N80-19320

Scintillation of UHF Satcom signals, ocurrence at Guam from mid-March 1978 - June 1979 [AD-A078267] N80-19328

Rain attenuation over Earth-satellite paths [AD-A075390] N80-19715

COMMUNICATION THEORY

Optical-communication systems for deep-space applications [NASA-CR-162982] N80-19323

Structures in aeronautical phraseology: From English to Spanish N80-19978

COMPENSATORS

Design of optimal tracking discrete control system [AD-A078751] N80-19890

COMPLEX VARIABLES

Note on normalization of variables and and equations [UCID-18083] N80-19908

COMPOSITE MATERIALS

Evaluation of aircraft windshield materials in a simulated supersonic flight environment [AD-A078673] N80-19082

Development of a composite geodetic structure for space construction, phase 1A [NASA-CR-160558] N80-19144

Assessment of Carbon Fiber Electrical Effects [NASA-CP-2119] N80-19193

Approach to the assessment of the hazard — fire released carbon fiber electrical effects N80-19194

Release of carbon fibers from burning composites N80-19195

Effects of carbon/graphite fiber contamination on high voltage electrical insulation N80-19203

Risk assessment of carbon fiber composite in surface transportation N80-19205

TI-59 magnetic card calculator solutions to composite materials formulas [AD-A078043] N80-19208

Evaluation of a polyurethane/polystyrene composite cushioning material [AD-A077918] N80-19271

Dynamic damping investigations on composites N80-19581

COMPOSITE PROPELLANTS

Turbulent boundary-layer analysis and experimental investigation of erosive burning problem of composite solid propellants [AD-A077351] N80-19289

COMPOSITE STRUCTURES

Data reduction and analysis of graphite fiber release experiments [NASA-CR-159032] N80-19048

Significance of large scatter of composite properties to aircraft reliability [AD-A077804] N80-19062

COMPRESSIBLE FLOW

Numerical integration of compressible, viscous flow equations [AD-A077558] N80-19457

COMPRESSOR BLADES

Core compressor exit stage study. 1: Aerodynamic and mechanical design [NASA-CR-159714] N80-19113

Aerodynamic and acoustic investigations of axial flow fan and compressor blade rows, including three-dimensional effects [AD-A077712] N80-19116

COMPUTATION

The influence of ionospheric models on calculations of decametric wave propagation N80-19383

COMPUTER ASSISTED INSTRUCTION

Computer aided evolutionary design for digital integrated systems [AD-A078124] N80-19865

Computer applications in remote sensing education N80-20013

COMPUTER DESIGN

Objectives for building an experimental CCIS N80-19815

COMPUTER GRAPHICS

A study of the canopy design for the advanced attack helicopter by use of computer graphics [AD-A078291] N80-19069

Toward global monitoring of the ionosphere in real time by a bottomside network: The geophysical requirements and the technological opportunity N80-19381

As-built design specifications of the LANDSAT Imagery Verification and Extraction System (LIVES). Volume 1: Text and appendices [E80-10077] N80-19586

Initial studies in objective forecasting of mesoscale weather using interactive computer system [AD-A077343] N80-19718

Development and usage of a false color display technique for presenting Seasat-A scatterometer data [NASA-CR-159203] N80-19862

Computer aided evolutionary design for software engineering [AD-A078060] N80-19866

Bayesian Interactive Graphics Reliability Assessment Procedure (BIGRAP) [AD-A077641] N80-19878

COMPUTER NETWORKS

Markovian availability model for a network of communicating computers N80-19525

Design and analysis of interconnection networks for partitionable parallel processing systems [AD-A078690] N80-19852

On the use of simulation in the design and implementation of distributed systems [AD-A078322] N80-19853

JOYCE: A language for computer networks [AD-A078706] N80-19879

Local reconfiguration of networks of processors: Arrays, trees, and graphs [AD-A077525] N80-19886

COMPUTER PROGRAMMING

The RADOT code system to calculate the radar return from a forested area [AD-A078471] N80-19333

Dependency directed reasoning for complex program understanding [AD-A078055] N80-19864

Metrics of software quality [AD-A077896] N80-19869

Numerical and data analysis techniques applied to scientific research, 3 [AD-A075383] N80-19874

Methodologies for computer program testing [AD-A077414] N80-19876

Cellular D-graph automata with augmented memory [AD-A077389] N80-19877

JOYCE: A language for computer networks [AD-A078706] N80-19879

FORTRAN program oblique in PL-format user's manual [AD-A077809] N80-19880

Natural language processing, volume 1. Citations from the NTIS data base [PB80-803281] N80-19883

Natural language processing, volume 2. Citations from the NTIS data base
[PB80-803299] N80-19884
Natural language processing. Citations from the Engineering Index data base
[PB80-803307] N80-19885
Nonlinear systems with Gaussian inputs: Representation, identification and inverse problems
[AD-A078597] N80-19900

COMPUTER PROGRAMS

Digital computer solution of aircraft longitudinal and lateral directional dynamic characteristics
[AD-A078672] N80-19088
A computer program for estimating aircraft landing distance
[AD-A077169] N80-19089
Advanced infrared signature prediction program. Spectral calculation of radiation from a turbine propulsion system as intercepted by an observer (SCORPION). Volume 3: Analysis
[AD-A078436] N80-19124
Evolution of the orbital improvement program
[AD-A078842] N80-19143
TI-59 magnetic card calculator solutions to composite materials formulas
[AD-A078043] N80-19208
Design of a program for expert diagnosis of acid base and electrolyte disturbances
[AD-A078413] N80-19226
A computer program for ELF/VLF pulse propagation in a laterally homogeneous Earth-ionosphere waveguide
[AD-A076306] N80-19341
Recent improvements to the spinning body version of the EDDYBL computer program
[NASA-CR-152347] N80-19448
A comparison of the results of several heat transfer computer codes when applied to a hypothetical nuclear waste repository
[ORNL/TM-7112] N80-19464
Introduction to software reliability: A key issue of computing systems reliability N80-19547
The NASA/MSFC global reference atmospheric model: MOD 3 (with spherical harmonic wind model)
[NASA-CR-3256] N80-19704
CLOUDS
[AD-A078363] N80-19716
Analyzing historical metsorological data for air quality analysis
[PB80-107154] N80-19743
SIMBOX: A general purpose defense systems simulator N80-19822
Using a language developed for aircraft simulators — advantages and disadvantages of using FORTRAN and assembly language N80-19831
The Mitre Interactive Communications Analysis Program (MICAP) N80-19835
GLOBALMIN: A computer program for global optimization
[AD-A078089] N80-19870
Using assertions for adaptive testing of software
[AD-A077398] N80-19875
A software lifecycle methodology and tool support
[AD-A076335] N80-19881
Performance collapse due to overhead in a simple, single-server queueing system
[AD-A078190] N80-19888
AMORD: A deductive procedure system
[AD-A078417] N80-19891
Design and implementation of a new descent algorithm for local optimization
[AD-A078220] N80-19896
Group decision making with feedback
[AD-A078159] N80-19980
Programming support library. Volume 1: Functional requirements
[AD-A078438] N80-19985

COMPUTER STORAGE DEVICES

Advanced electronic technology
[AD-A077589] N80-20021

COMPUTER SYSTEMS DESIGN

Interactive analysis program activity N80-19166
JPL analytical performance prediction capability — for antenna systems N80-19167
As-built design specifications of the LANDSAT Imagery Verification and Extraction System (LIVES). Volume 1: Test and appendices
[E80-10077] N80-19586
On the use of simulation in the design and implementation of distributed systems
[AD-A078322] N80-19883
Distribution data base design
[EPRI-EL-1150-VOL-1] N80-19855
Distribution data base design
[EPRI-EL-1150-VOL-2] N80-19856
Distribution data base design
[EPRI-EL-1150-VOL-3] N80-19857
Random access memories, volume 2. Citations from the Engineering Index data base
[PB80-802358] N80-19880
NSSC-2 operating system design requirements specification
[NASA-CR-161396] N80-19881

COMPUTER SYSTEMS PROGRAMS

Nondestructive evaluation of airport pavements. Volume 2: Operational manual for PAVBEN program at TCC
[AD-A079495] N80-19130
Interactive analysis program activity N80-19166
JPL analytical performance prediction capability — for antenna systems N80-19167
Orbit attitude processor. STS-1 bench program verification test plan
[JSC-16366] N80-19179
Software reliability: Understanding and improving it N80-19548
Formal methods for achieving reliable software N80-19549
Quantitative assessments of software reliability N80-19550
An analysis of software reliability prediction models N80-19551
Analytical software verification N80-19552
Software quality and its assurance N80-19553
Software development for TORNADO: A case history from the reliability and maintainability aspect N80-19554
As-built design specifications of the LANDSAT Imagery Verification and Extraction System (LIVES). Volume 1: Test and appendices
[E80-10077] N80-19586
E-3A navigational computer system real-time environmental simulator N80-19824
Simulation for whole life development N80-19839
A simulation support system, the development tool for avionic systems and subsystems N80-19840
FORTRAN program oblique in PL-format user's manual
[AD-A077809] N80-19880

COMPUTER TECHNIQUES

The Mitre Interactive Communications Analysis Program (MICAP) N80-19835

COMPUTERIZED DESIGN

A study of the canopy design for the advanced attack helicopter by use of computer graphics
[AD-A078291] N80-19069
Nondestructive evaluation of airport pavements. Volume 2: Operational manual for PAVBEN program at TCC
[AD-A079495] N80-19130
Radio network and radio link surveys derived by computer from a terrain data base N80-19365
Computer aided evolutionary design for software engineering
[AD-A078060] N80-19886
Generalizations of the sequential sign detector
[AD-A078110] N80-19899

COMPUTERIZED SIMULATION

Easy ACLS dynamic analysis, volume 2. Part 2: Component computer programs
[AD-A079803] N80-19076
Systems studies of coal conversion processes using a reference simulator
[FE-2275-11] N80-19307
Computerized models for design and analysis of computer communications systems
[AD-A078022] N80-19324
Monte Carlo simulation for integrated circuits
[BLL-RTS-11885] N80-19421
A simulation program for the determination of system reliability of complex avionic systems N80-19523
Computer simulation model of the logistic support system for electrical engineering test equipment N80-19560
User's guide to the ELSTAR photochemical air quality simulation model
[PB80-109184] N80-19675

CONFERENCES

Delta7: A computer model of Delta growth
[AD-A077053] N80-19892
Modeling and Simulation of Avionics Systems and Command, Control and Communications systems — conferences
[AGARD-CP-268] N80-19809
An introduction to the selection and use of simulation languages N80-19810
An introduction to statistical analysis of simulation output data N80-19811
Remarks on simulation. Objectives/areas of use/possibilities/limitations: An overview N80-19812
Representing human thought and response in military conflict simulation models N80-19813
Simulation of overall air defense command and control N80-19816
Theater air defense engagement simulation-command/control/communications ns-C3): An approach to theater air defense model/methodology development N80-19817
Simulation of air defence operations and multiple air combat N80-19818
Simulation within military defence systems for training and evaluation N80-19819
Real-time simulation: An indispensable but overused evaluation technique N80-19820
Design and simulation of a C3 system for surveillance purpose N80-19821
SIMBOX: A general purpose defense systems simulator N80-19822
The application of modeling and simulation to the development of the E-3A N80-19823
Application of computer simulations to development of NATO E-3A automatic track initiation algorithms N80-19827
Use of simulation in the evaluation of the IFFN process N80-19833
Air-to-air engagement simulation N80-19834
The role of the aircraft model in avionic systems simulation N80-19837
Avionics evaluation program: Simulation models for the effectiveness analysis of avionics N80-19838
Simulation for whole life development N80-19839
A simulation support system, the development tool for avionic systems and subsystems N80-19840
On the use of simulation in the design and implementation of distributed systems
[AD-A078322] N80-19883
Design and implementation of a new descent algorithm for local optimization
[AD-A078220] N80-19896

COMPUTERS

Computer applications — agriculture
[LA-7844-PR] N80-19854

CONCENTRATION (COMPOSITION)

Effects of flights differing in duration on protein composition of cosmonauts blood N80-19757

CONCENTRATORS

Low cost point focus solar concentrator. Phase 1: Preliminary design
[JPL-9950-273] N80-19622
Low cost point focus solar concentrator, phase 1
[NASA-CR-162848] N80-19624
Low-costs point-focus solar concentrator, phase 1
[NASA-CR-162839] N80-19625

CONDUCTORS

Electromagnetic shielding of structural foams by using internal conductive materials
[AD-A078718] N80-19329

CONFERENCES

Workshop on Aircraft Surface Representation for Aerodynamic Computation
[NASA-TM-81170] N80-19025
Proceedings of a Workshop on V/STOL Aircraft Aerodynamics, volume 2 — conferences
[AD-A079909] N80-19042
Proceedings of a Workshop on V/STOL Aircraft Aerodynamics, volume 1
[AD-A079115] N80-19074
Parameter identification — conference on techniques applied to aircraft flight test data
[AGARD-LS-104] N80-19094
The 4th International Symposium on Air Breathing Engines
[AD-A078958] N80-19114
Large Space Systems Technology, 1979 — antenna and space platform systems conference
[NASA-CP-2118] N80-19145

Proceedings of the National Symposium on Wear and Corrosion
[AD-A077406] N80-19253
Proceedings of the Antenna Applications Symposium
[AD-A077167] N80-19334
Terrain profiles and contours in electromagnetic wave propagation
[AGARD-CP-269] N80-19345
Special topics in HF propagation
[AGARD-CP-263] N80-19372
Avionics Reliability, Its Techniques and Related Disciplines — conferences
[AGARD-CP-281] N80-19619
Modeling and Simulation of Avionics Systems and Command, Control and Communications systems — conferences
[AGARD-CP-268] N80-19809
Display Working Group Joint DARCOM/NMC/AFLC/AFSC Panel on the Field of Night Vision Technology — conferences
[AD-A077061] N80-19851
Conference of Remote Sensing Educators (CORSE-79)
[NASA-CP-2102] N80-20003
Data reduction by computer processing N80-20016
Proceedings of the Association for Unmanned Vehicle Systems AUVS '79: 6th Annual Convention
[AD-A077877] N80-20018

CONFIDENCE LIMITS
Prediction intervals for first order Markov processes
[AD-A078283] N80-19918
Delta-exact lower confidence bounds for series system reliability
[AD-A077524] N80-19923

CONFIGURATION MANAGEMENT
Flight evaluation of configuration management system concepts during transition to the landing approach for a powered-lift STOL aircraft
[NASA-TM-81146] N80-19127

CONFORMAL MAPPING
Dispersion mapping theorems
[AD-A079704] N80-19907

CONGRESSIONAL REPORTS
NASA authorization, 1981, program review, volume 2
[GPO-98-220] N80-19988

CONICAL BODIES
Free-flight base pressure measurements on 8 deg cones
[AD-A075365] N80-19036

CONSUMERS
Effects of carbon fibers on consumer products N80-19204

CONTACT RESISTANCE
Testing the contact characteristics of electro-deposited coatings, part 1 — corrosion tests
[BLL-RTS-11808] N80-19514

CONTAMINANTS
Pollutants from synthetic fuels production: Sampling and analysis methods for coal gasification
[PB80-104656] N80-19309

CONTAMINATION
Effects of carbon/graphite fiber contamination on high voltage electrical insulation N80-19203
ISS-SIMS surface characterization of smut on stainless steel
[AD-A078122] N80-19238
Contamination of the anode and cathode in phosphoric acid anodizing electrolytes
[AD-A077885] N80-19240

CONTINUOUS WAVE LASERS
An efficient rotational nonequilibrium model of a cw chemical laser
[AD-A078485] N80-19487

CONTINUUM MECHANICS
A continuum model of protein transport across the endothelium in the lungs and in the body of humans N80-19778

CONTRACT NEGOTIATION
Competition in the acquistion of major weapons systems
[AD-A078268] N80-19981

CONTRACTS
Reliability improvement warranty: An overview N80-19527
Reliability clauses in contracts N80-19528
The increase of the reliability of electronic equipment subject to reliability clauses N80-19529

CONTROL
Power system control study. Phase 1: Integrated control techniques
[AD-A078629] N80-19125

CONTROL CONFIGURED VEHICLES
A fault tolerant architecture approach to avionics reliability improvement N80-19533

CONTROL EQUIPMENT
Microprocessor controlled ejection seat
[AD-A077479] N80-19049

CONTROL STABILITY
Practical input signal design — For identifying stability and control derivatives N80-19097
Aspects of flight test instrumentation — methods to derive aircraft performance and stability and control characteristics N80-19098
Analysis of aircraft performance stability and control measures N80-19099

CONTROL SURFACES
Developing, mechanizing and testing of a digital active flutter suppression system for a modified B-52 wind-tunnel model
[NASA-CR-159155] N80-19586

CONTROL THEORY
Minimum time turns with thrust reversal — using control theory
[AD-A079651] N80-19078
Developing, mechanizing and testing of a digital active flutter suppression system for a modified B-52 wind-tunnel model
[NASA-CR-159155] N80-19586
Generalizations of the sequential sign detector
[AD-A078110] N80-19689
Combining and updating of local estimates and regional maps along sets of one-dimensional tracks
[AD-A080034] N80-19902

CONTROLLABILITY
Flight evaluation of configuration management system concepts during transition to the landing approach for a powered-lift STOL aircraft
[NASA-TM-81146] N80-19127

CONTROLLERS
Solid state power controller verification studies
[AD-A078238] N80-19429

CONVECTION CURRENTS
Solving the non-linear equations of deep convection
[BLL-TRANS-1397-(9022.549)] N80-19880
Lidar measurement of boundary layer winds and convective structure
[AD-A078580] N80-19719

CONVECTIVE FLOW
Convective flows of viscous fluid in spherical layers. Certain astrophysical applications
[NASA-TM-75823] N80-19452

CONVERGENCE
Analytic and numerical investigation of the convergence for the adaptive-wall concept
[AD-A078203] N80-19134
On the weak convergence of a sequence of general stochastic difference equations to a diffusion
[AD-A080082] N80-19903
On the weak law of large numbers D(0,1)
[AD-A078130] N80-19926
Differential geometry, surface patches and convergence methods
[AD-A078061] N80-19927

COOLING SYSTEMS
On the characteristics of centrifugal-reciprocating machines — cryogenic coolers
[NASA-CR-162881] N80-19499

COORDINATE TRANSFORMATIONS
Predicting unobservable values and estimating missing ones: A coordinate-free approach, part 2
[AD-A078241] N80-19916

COORDINATES
Application of a numerically generated orthogonal coordinate system to the solution of inviscid axisymmetric supersonic flow over blunt bodies
[NASA-TP-1619] N80-19031

COPOLYMERS
Activation by means of colloidal palladium in the electroplating of ABS copolymers. 2: The nature of the palladium/tin (2) chloride activating solution
[BLL-RTS-11924] N80-19261
Ways to inorganic polymers
[BLL-RTS-11805] N80-19262
The crystallization thermodynamics of piezoelectric copolymers
[AD-A078705] N80-19278

COPPER
Emerging materials systems for solar cell applications-Cu/sub 2-x/Se
[DOE/ET-23005-T2] N80-19853

COPPER ALLOYS
The corrosion fatigue behavior of a high purity Al-Zn-Mg-Cu alloy
[AD-A077481] N80-19247

CORRELATION
Final state correlation effects in auger lineshapes: Application to silicon dioxide
[AD-A078037] N80-19221
Predicting unobservable values and estimating missing ones: A coordinate-free approach, part 2
[AD-A078241] N80-19916

CORRELATORS
Analog binary programmable transversal filter
[AD-A078880] N80-19437
Binary/analog CCD correlator development
[AD-A077572] N80-19849

CORROSION
Corrosion of aluminum alloys in high velocity seawater
[AD-A078435] N80-19251

CORROSION PREVENTION
Proceedings of the National Symposium on Wear and Corrosion
[AD-A077406] N80-19253

CORROSION RESISTANCE
The corrosion of silicate materials by hydrogen gas and hydrofluoric acid solution
[LBL-9987] N80-19214
Proceedings of the National Symposium on Wear and Corrosion
[AD-A077406] N80-19253

CORROSION TESTS
Testing the contact characteristics of electro-deposited coatings, part 1 — corrosion tests
[BLL-RTS-11808] N80-19514

COST ANALYSIS
Low cost point focus solar concentrator, phase 1
[NASA-CR-162848] N80-19624
Cost-effectiveness of flight simulators for military training N80-19830
Effects of tunnel and station size on the costs and service of subway transit systems
[UMTA-CA-06-0116-79-2] N80-19989

COST EFFECTIVENESS
Impacts of technologies selected on the reliability and operational availability of equipments. Cost considerations N80-19536
Quantitative assessments of software reliability N80-19550
Cost-effectiveness of flight simulators for military training N80-19830
Modeling the human operator: Applications to system cost effectiveness N80-19846
The space science data service: A study of its efficiencies and costs
[NASA-TM-80760] N80-19982

COST ESTIMATES
MEK: A new procedure for development of maintenances policies — in logistics management and cost estimates for weapon systems N80-19556

COST REDUCTION
A software lifecycle methodology and tool support
[AD-A078335] N80-19881

COUPLERS
Injection laser waveguide coupler
[AD-A077030] N80-19484

COUPLING COEFFICIENTS
Injection laser waveguide coupler
[AD-A077030] N80-19484

COUPLINGS
Characteristics of mechanically fastened joints of CIP/HIP-1 Beryllium
[AD-A078275] N80-19500

COVARIANCE
Predicting unobservable values and estimating missing ones: A coordinate-free approach, part 2
[AD-A078241] N80-19916

CRACK PROPAGATION
Evaluation of dynamically riveted joints
[AD-A077223] N80-19504

CRACKING (FRACTURING)
USAF damage tolerant design handbook: Guidelines for the analysis and design of damage tolerant aircraft structures, revision A
[AD-A078216] N80-19085
Machining flaws and the strength grain size behavior of ceramics
[AD-A077536] N80-19277
CROP GROWTH
Quantitative estimation of plant characteristics using spectral measurement: A survey of the literature
[E80-10078] N80-19587
CROP IDENTIFICATION
Remote sensing applications to resource problems in South Dakota — Chamberlain, Rapid City; Watertown; Spink County; Lake Herman and Six-Mile Creek Watersheds; and Missouri River waterfowl
[E80-10096] N80-19593
CROP INVENTORIES
Quantitative estimation of plant characteristics using spectral measurement: A survey of the literature
[E80-10078] N80-19587
A critical comparison of remote sensing and other methods for nondestructive estimation of standing crop biomass
[E80-10082] N80-19590
CROSS FLOW
Vorticity associated with multiple jets in a crossflow — vertical takeoff aircraft
[NASA-CR-162655] N80-19454
CROSSED FIELD AMPLIFIERS
I/J band low-cost crossed-field amplifier
[AD-A077322] N80-19436
CROSSLINKING
Ways to inorganic polymers
[BLL-RTS-11905] N80-19262
CRUDE OIL
Alaskan environmental research. Section 12.0 of part 2: Ecological sciences
[PNL-2850-PT-2-SUPPL] N80-19666
CRUISE MISSILES
Cruise-missile-carrier navigation requirements N80-19843
Proceedings of the Association for Unmanned Vehicle Systems AUVS '79: 6th Annual Convention
[AD-A077677] N80-20018
CRYOGENIC EQUIPMENT
Capillary acquisition devices for high-performance vehicles: Executive summary — evaluation of cryogenic propellant management techniques using the centaur launch vehicle
[NASA-CR-159658] N80-19185
Cooling liquid He-3 below 1 mK by nuclear demagnetization N80-19311
CRYOGENIC ROCKET PROPELLANTS
Capillary acquisition devices for high-performance vehicles: Executive summary — evaluation of cryogenic propellant management techniques using the centaur launch vehicle
[NASA-CR-159658] N80-19185
CRYOGENIC WIND TUNNELS
A theoretical analysis of simulated transonic boundary layers in cryogenic-nitrogen wind tunnels
[NASA-TP-1631] N80-19131
Toward new transonic windtunnels
[AGARD-AG-240] N80-19137
Development of the cryogenic tunnel concept and application to the US National Transonic Facility N80-19139
The cryogenic wind tunnel: another option for the European Transonic Facility N80-19140
CRYOGENICS
Cooling liquid He-3 below 1 mK by nuclear demagnetization N80-19311
On the characteristics of centrifugal-reciprocating machines — cryogenic coolers
[NASA-CR-162881] N80-19499
CRYSTAL GROWTH
Crystal growth and phase stability of metastable indium antimonide bismide thin films N80-19965
CRYSTAL OSCILLATORS
Crystal-controlled projectile telemetry transmitter
[AD-A078214] N80-19180
CRYSTALLINITY
Comparison of crystallinity and molecular orientation between surface and bulk of some polymers by FTIR-ATR and transmission spectroscopy — polyethylene and polypropylene
[AD-A078243] N80-19289
CRYSTALLIZATION
The crystallization thermodynamics of piezoelectric copolymers
[AD-A078705] N80-19276
CRYSTALLOGRAPHY
Why do glassy materials possess energy gaps
[AD-A078668] N80-19968
CULTURE TECHNIQUES
NASA standard procedures for the microbiological examination of space hardware
[NASA-TM-80756] N80-19749
CURRENT DENSITY
Studies of silicon p-n junction solar cells
[NASA-CR-162832] N80-19809
CURRENT DISTRIBUTION
The effects of stratified ground on characteristics of the inverted L antenna — current distributions, antenna radiation patterns, and impedance characteristics N80-19346
Terrain effects on log-periodic antenna characteristics using the singularity expansion method N80-19349
CUSHIONS
Evaluation of a polyurethane/polystyrene composite cushioning material
[AD-A077918] N80-19271
CYCLONES
Tropical cyclone origin, movement, and intensity characteristics based on data compositing techniques
[AD-A078624] N80-19739
CYCLOTRON RESONANCE
Theory of electron cyclotron resonance heating of Tokamak plasmas
[AD-A075362] N80-19957
CYLINDRICAL BODIES
Navier-Stokes solutions for spin-up from rest in a cylindrical container
[AD-A077115] N80-19455
Magnetosheath effects on cylindrical Langmuir probes
[NASA-CR-162952] N80-19958
CYLINDRICAL SHELLS
Transverse oscillations of smooth and rough cylinders in harmonic flow
[AD-A078271] N80-19934

D

D REGION
Measurement of electron densities in the middle atmosphere using rocket borne blunt probes
[AD-A078148] N80-19686
DAMPING
Damping in tapered annular seals for an incompressible fluid
[NASA-TP-1646] N80-19495
DAMPING TESTS
Dynamic damping investigations on composites N80-19581
Damping effects in joints and experimental tests on riveted specimens N80-19584
DAMS
Cataract hydroelectric development expansion study
[DOE/ID-01796-1] N80-19650
Potential hydroelectric power, vertical turbine, spillway combine Broadwater Dam
[DOE/ID-01822-1] N80-19651
DATA ACQUISITION
Wind tunnel and free flight model identification experience N80-19103
Magnetospheric research
[NASA-CR-161410] N80-19684
Methods for analysing the homogeneity of climatological series
[BLL-TRANS-1407-(9022.549)] N80-19701
DATA BASES
Biological and geophysical factors of electromagnetic wave propagation and their use in digital data banks N80-19363
VHF/UHF path-loss calculations using terrain profiles deduced from a digital topographic data base N80-19366
As-built design specifications of the LANDSAT Imagery Verification and Extraction System (LIVES). Volume 1: Text and appendices
[E80-10077] N80-19586
Distribution data base design
[EPRI-EL-1150-VOL-1] N80-19855
Distribution data base design
[EPRI-EL-1150-VOL-2] N80-19856
Distribution data base design
[EPRI-EL-1150-VOL-3] N80-19857
A formal definition of AMDL
[AD-A078035] N80-19867
The space science data service: A study of its efficiencies and costs
[NASA-TM-80760] N80-19982
Serializability of concurrent database updates
[AD-A078414] N80-19984
On optimization of query processing strategies
[AD-A078470] N80-19988
NLM online services reference manual
[PB80-114531] N80-19987
DATA COMPRESSION
Interframe adaptive data compression techniques for images
[AD-A078641] N80-19873
DATA MANAGEMENT
The structure of specifications and implementations of data abstraction
[AD-A077427] N80-19850
Software engineering principles
[AD-A078005] N80-19868
DATA PROCESSING
Data analysis for Ocean Thermal Energy Conversion (OTEC)
[AD-A077908] N80-19638
Analyzing historical meteorological data for air quality analysis
[PB80-107154] N80-19743
Computer applications — agriculture
[LA-7944-PR] N80-19854
Methodologies for computer program testing
[AD-A077414] N80-19875
Natural language processing, volume 1. Citations from the NTIS data base
[PB80-803291] N80-19883
Natural language processing, volume 2. Citations from the NTIS data base
[PB80-803299] N80-19884
Natural language processing. Citations from the Engineering Index data base
[PB80-803307] N80-19885
DATA REDUCTION
Data reduction and analysis of graphite fiber release experiments
[NASA-CR-159032] N80-19048
Magnetospheric research
[NASA-CR-161410] N80-19684
An introduction to statistical analysis of simulation output data N80-19811
Data reduction by computer processing N80-20016
The reduction of remote sensing data by visual means — education N80-20017
DATA RETRIEVAL
Serializability of concurrent database updates
[AD-A078414] N80-19984
DATA SMOOTHING
A stochastic realization approach to the smoothing problem. Revised — linear systems
[AD-A078137] N80-19917
DATA STORAGE
Security kernel design for a micro-processor-based, multilevel archival storage system
[AD-A078281] N80-19848
Distribution data base design
[EPRI-EL-1150-VOL-1] N80-19855
Distribution data base design
[EPRI-EL-1150-VOL-2] N80-19856
Distribution data base design
[EPRI-EL-1150-VOL-3] N80-19857
Random access memories. Citations from the NTIS data base
[PB80-802333] N80-19858
Random access memories, volume 1. Citations from the Engineering Index data base
[PB80-802341] N80-19859
Programming support library. Volume 1: Functional requirements
[AD-A078438] N80-19985
DATA SYSTEMS
Serializability of concurrent database updates
[AD-A078414] N80-19984

Annual review of research under the joint service electronics program
[AD-A077652] N80-20019

DATA TRANSMISSION
Digital on-line processing and display of multiparameter HF transmission data N80-19416

DECAMETRIC WAVES
The influence of ionospheric models on calculations of decametric wave propagation N80-19380

DECISION MAKING
Aircraft emergency decisions: Cognitive and situational variables
[AD-A077413] N80-19051
Impacts of technologies selected on the reliability and operational availability of equipments. Cost considerations N80-19336
An approach for providing more accurate probability assessments
[AD-A077994] N80-19979
Group decision making with feedback
[AD-A078159] N80-19980

DECISION THEORY
Group decision making with feedback
[AD-A078159] N80-19980

DECOMPRESSION SICKNESS
Probability of altitude decompression disorders when breathing oxygen containing human waste gases N80-19762

DEDUCTION
Dependency directed reasoning for complex program understanding
[AD-A079055] N80-19964

DEEP SPACE
Photometry of artificial satellites application to the Ground Electro-Optical Deep Space Surveillance (GEODSS) program
[AD-A078675] N80-19178
Optical-communication systems for deep-space applications
[NASA-CR-162992] N80-19323

DEFECTS
Failure causing defects in ceramics: What NDE should find
[AD-A078234] N80-19257
Machining flaws and the strength grain size behavior of ceramics
[AD-A077536] N80-19277

DEFORMATION
Indirect deformation (strain) measurements and calibrations in Sandia triaxial apparatus for rock testing to 250 C
[SAND-79-0114] N80-19696

DEGRADATION
LSA field test
[NASA-CR-162798] N80-19611

DELTAS
Delta7: A computer model of Delta growth
[AD-A077053] N80-19692

DENITROGENATION
Kinetics and mechanism of desulfurization and denitrogenation of coal-derived liquids — quioline, indole, dibenzothiophene, and naphthalene
[FE-2028-15] N80-19292

DENSITOMETERS
The 6-beam test, for gamma densitometer
[LTR-141-122] N80-19477

DENSITY (MASS/VOLUME)
The effect of nickel and nitrogen on void formation in vanadium N80-19232

DENSITY DISTRIBUTION
Isoelectric focusing of red blood cells in a density gradient stabilized column
[NASA-TM-78288] N80-19217

DEPLOYMENT
Recovery system preliminary design. A simplified approach to determining staging, timing and altitude requirements for fast inflating parachutes
[AD-A077548] N80-19041

DESCENT TRAJECTORIES
Analysis of fuel-conservative curved decelerating approach trajectories for powered-lift and CTOL jet aircraft
[NASA-TP-1650] N80-19022

DESIGN ANALYSIS
New remotely piloted vehicle launch and recovery concepts. Volume 1: Analysis, preliminary design and performance/cost trade studies
[AD-A077475] N80-19068
The F-16 Wild Weasel: A feasibility study
[AD-A077650] N80-19071
Aerodynamic investigation of C-141 leading edge modification for cruise drag reduction, volume 2
[AD-A077699] N80-19081
Interactive analysis program activity N80-19188
Software development for TORNADO: A case history from the reliability and maintainability aspect N80-19554
Fastener hole quality, volume 1 — design analysis of fatigue life and drilling techniques for fasteners in aircraft production
[AD-A077859] N80-19567

DESORPTION
Photodesorption of gases from metal and semiconductor surfaces N80-19984

DESULFURIZING
Kinetics and mechanism of desulfurization and denitrogenation of coal-derived liquids — quioline, indole, dibenzothiophene, and naphthalene
[FE-2028-15] N80-19292
The chemistry of sulfur in char and the implications for hydrogasification/hydrodesulfurization
[FE-2449-9] N80-19298

DETECTORS
Preliminary assessment of an automated system for detecting present weather
[AD-A079031] N80-19706

DETERMINANTS
A recursion theoretic analysis of certain generalizations of Ramsey's theorem and of the Gale-Stewart theorem N80-19693

DETONATION
Deflagration-to-detonation transition in HMS based propellants
[AD-A079845] N80-19290
Steady-wave analysis of the effect of porosity on viscous and inviscid detonations by use of a reactive-porous analog
[LA-7819] N80-19483

DEVELOPING NATIONS
Potential of biomass conversion in meeting the energy needs of the rural populations of developing countries: An overview
[BNL-26721] N80-19294

DIAGNOSIS
Design of a program for expert diagnosis of acid base and electrolyte disturbances
[AD-A079413] N80-19226

DIELECTRIC PROPERTIES
Ray optical description of waves guided by integrated dielectric cylinder-cone structures
[AD-A078344] N80-19343

DIELECTRICS
Modes of dielectric waveguides of arbitrary cross-sectional shape
[AD-A077032] N80-19337
Theoretical aspects of transient radiation and scattering in lossless two medium half space N80-19357

DIES
Exploratory development of die materials for isothermal forging of titanium alloys
[AD-A078951] N80-19249

DIESEL ENGINES
Experimental investigation into the heat flux in the piston and cylinder liner of a high-speed diesel engine
[BLL-RTS-11902] N80-19494
Issues concerning the light-duty diesel
[DOE/EV-0050/1] N80-19510

DIESEL FUELS
Evaluation of fuel character effects on J79 engine combustion system
[AD-A078440] N80-19119
Diesel engine endurance test with water-containing fire-resistant fuel
[AD-A078665] N80-19287

DIETS
Alimentary hypokinesis
[NASA-TM-75989] N80-19784

DIFFERENCE EQUATIONS
On the weak convergence of a sequence of general stochastic difference equations to a diffusion
[AD-A080082] N80-19903
Solutions to wave equations using an artificial viscosity method
[UCRL-TRANS-11492] N80-19909

DIFFERENTIAL EQUATIONS
One-sided continuous dependence of maximal solutions — Carathéodory condition
[AD-A079722] N80-19906
Solutions to wave equations using an artificial viscosity method
[UCRL-TRANS-11492] N80-19909
Integration of nonlinear differential equations. A bibliography with abstracts
[PB80-802978] N80-19912
A stochastic realization approach to the smoothing problem. Revised — linear systems
[AD-A078137] N80-19917

DIFFERENTIAL GEOMETRY
Differential geometry, surface patches and convergence methods
[AD-A078081] N80-19927

DIFFRACTION PATTERNS
Diffraction phenomena during multipath fading N80-19371

DIFFUSION
Global bounds and approximations for nonlinear diffusion problems
[AD-A076343] N80-19507
A continuum model of protein transport across the endothelium in the lungs and in the body of humans N80-19778
Special function solutions of the diffusion equation
[AD-A075224] N80-19899

DIFFUSION THEORY
On the weak convergence of a sequence of general stochastic difference equations to a diffusion
[AD-A080082] N80-19903

DIGESTIVE SYSTEM
Alimentary hypokinesis
[NASA-TM-75989] N80-19784

DIGITAL COMMAND SYSTEMS
Variable cycle engine multivariable control synthesis: Control structure definition
[AD-A078670] N80-19117

DIGITAL COMPUTERS
An introduction to the selection and use of simulation languages N80-19810
Fire control for air-to-air gunnery in high performance fighter aircraft N80-19641
A formal definition of AMDL
[AD-A078035] N80-19667

DIGITAL DATA
Biological and geophysical factors of electromagnetic wave propagation and their use in digital data banks N80-19363

DIGITAL NAVIGATION
Navigation systems for approach and landing of VTOL aircraft
[NASA-CR-152335] N80-19055

DIGITAL RADAR SYSTEMS
Azimuth beamwidth effect on radar sensed terrain horizon profiles N80-19362

DIGITAL SIMULATION
Closed loop models for analyzing engineering requirements for simulators
[NASA-CR-2965] N80-19063
Two dimensional convective flamespreading in packed beds of granular propellant — using digital simulation
[AD-A075326] N80-19285
Some of the problems in digital terrain model construction N80-19361
Verification and validation of avionic simulations N80-19614
New possibilities offered by a radio-inertial hybrid guidance system digital simulation study N80-19636

DIGITAL SYSTEMS
Analysis of first and second order binary quantized digital phase-locked loops for ideal and white Gaussian noise inputs
[NASA-CR-162854] N80-19058
Channel measurement for wideband digital communication over fading channels N80-19316
Trends in reliability modeling technology for fault tolerant systems N80-19534
A bounding technique for integer linear programming with binary variables
[AD-A075575] N80-19682
Linear time calculations of geometric properties using quadtrees
[AD-A078087] N80-19697

DIGITAL TECHNIQUES
Application of the concept of dynamic trim control to automatic landing of carrier aircraft — utilizing digital feedforward control
[NASA-TP-1512] N80-19126

CAMAC system for computer control of microwave spectrometers
[LBL-8276] N80-19230
COPAS: A high speed real-time digital audio processor
[BBC-RD-1979/26] N80-19455
Developing, mechanizing and testing of a digital active flutter suppression system for a modified B-52 wind-tunnel model
[NASA-CR-159195] N80-19568
Interactive digital image processing investigation
[AD-A076342] N80-19601
Development and usage of a false color display technique for presenting Seasat-A scatterometer data
[NASA-CR-158833] N80-19662
Application of digital image processing techniques to astronomical imagery, 1979
[NASA-CR-162677] N80-19996
Data reduction by computer processing N80-20016

DIPOLE ANTENNAS
Comparison of loop and dipole antennas in leaky feeder communication systems N80-19412

DIRECT CURRENT
A mathematical investigation of the dynamic resistance of a DC electrical machine N80-19422

DIRECTIONAL ANTENNAS
Proceedings of the Antenna Applications Symposium
[AD-A077167] N80-19334

DIRECTIONAL STABILITY
Thrust vectoring to eliminate the vertical stabilizer — to provide directional stability for f-111 aircraft while decreasing radar detectability
[AD-A079852] N80-19077

DISCRETE FUNCTIONS
Design of optimal tracking discrete control system
[AD-A078751] N80-19890

DISPERSIONS
The theoretical treatment of particle swarms
[AD-A078218] N80-20000

DISPLAY DEVICES
Flight path displays
[AD-A077181] N80-19107
Digital on-line processing and display of multiparameter HF transmission data N80-19416
Pulse height analyzer/oscilloscope display interface
[DP-1534] N80-19478
Simulation of a night vision system for low level helicopter operations — using helmet mounted display device N80-19832

DISSOCIATION
Dissociative and double photoionization of CO2 from threshold to 90 A
[NASA-CR-162844] N80-19929

DISTANCE
A computer program for estimating aircraft landing distance
[AD-A077169] N80-19088

DISTRIBUTION
Magnetic moment versus temperature curves of rare-earth iron garnets
[AD-A077356] N80-19970

DIURNAL VARIATIONS
Basic findings helpful for ionospheric predictions — lunar tides in the F region N80-19367

DOCUMENTS
Reliability clauses in contracts N80-19528
The levels of edit, second edition
[NASA-CR-162880] N80-19983

DOPPLER EFFECT
Ultrasonic Doppler directional blood flow velocity meter
[RAE-LIB-TRANS-1918] N80-19780

DOPPLER NAVIGATION
Evolution of the orbital improvement program
[AD-A078842] N80-19143

DOPPLER RADAR
Range vernier
[AD-A077178] N80-19335
Sea-state directional spectra observed by HF Doppler radar N80-19401

DOUBLE BASE PROPELLANTS
Mechanistic studies of the effect of lead salts on double base propellant combustion. The use of model systems — effects of lead oxides on pyrolysis of propyl nitrates
[AD-A075371] N80-19286

DOUBLE BASE ROCKET PROPELLANTS
Deflagration-to-detonation transition in HMS based propellants
[AD-A078845] N80-19290

DOWNTIME
Markovian availability model for a network of communicating computers N80-19525
Application of the lognormal distribution to corrective maintenance downtimes N80-19545

DRAG REDUCTION
Aerodynamic investigation of C-141 leading edge modification for cruise drag reduction, volume 2
[AD-A077688] N80-19091

DRAINAGE PATTERNS
Multisensor analysis of hydrologic features in the Wind River Range, Wyoming with emphasis on the SEASAT SAR
[E80-10083] N80-19591

DRILLING
Fastener hole quality, volume 1 — design analysis of fatigue life and drilling techniques for fasteners in aircraft production
[AD-A077859] N80-19567

DROPS (LIQUIDS)
Atomization of a liquid by a spray nozzle
[NASA-TM-75771] N80-19447

DUCTED FANS
Investigation of fan blades shroud mechanical damping
[AD-A078439] N80-19120

DUNES
Use of remote sensing for land use policy formulation — Kalamazoo, Lake, Mecosta, Newaygo, Osceola, and Wexford counties, Michigan
[E80-10085] N80-19582

DUST
Setting priorities for control of fugitive particulate emissions from open sources
[PB80-108962] N80-19674

DUST COLLECTORS
Electrostatic precipitations for collection of high resistivity ash
[PB80-112386] N80-19671

DYNAMIC CHARACTERISTICS
Dynamic Environmental Qualification Techniques
[AGARD-R-682] N80-19090
Application of MIL-STD-810C dynamic requirements to USAF avionics procurements N80-19091
Dynamic environments and test simulation for qualification of aircraft equipment and external stores N80-19092
Aircraft parameter identification methods and their applications: Survey and future aspects N80-19095
Simulation for integration with dynamic tests of the logical elements of principal onboard computers N80-19842

DYNAMIC CONTROL
Application of the concept of dynamic trim control to automatic landing of carrier aircraft — utilizing digital feedforward control
[NASA-TP-1512] N80-19126

DYNAMIC MODELS
Large space system control technology model order reduction study N80-19164
LaRC controls activity for LSST N80-19165

DYNAMIC RESPONSE
Damping in tapered annular seals for an incompressible fluid
[NASA-TP-1646] N80-19495
Effect of structural damping on the dynamic response of spacecraft N80-19577

DYNAMIC STABILITY
Investigation of surface stabilized high-pressure gas discharges
[AD-A077040] N80-19483

DYNAMIC TESTS
The effect of test system misalignment in the dynamic torsion test
[NASA-CR-162829] N80-19564
Dynamic damping investigations on composites N80-19581

E

E REGION
A sporadic E prediction technique N80-19397

E-3A AIRCRAFT
E-3A navigational computer system real-time environmental simulator N80-19824
A JTIDS performance model for the E-3A N80-19825
Application of computer simulations to development of NATO E-3A automatic track initiation algorithms N80-19827

EAR PROTECTORS
Effects of artillery noise on the hearing of protected crew personnel
[AD-A078884] N80-19805

EARLY WARNING SYSTEMS
Simulation of overall air defense command and control N80-19818

EARTH (PLANET)
Geodynamics International - 15
[PB80-111099] N80-19698

EARTH ATMOSPHERE
Measurement of electron densities in the middle atmosphere using rocket borne blunt probes
[AD-A078148] N80-19886
A comparative analysis of Rawinsonde and Nimbus-6 and Tiros-N satellite profile data
[AD-A079295] N80-19737
The determination of atmospheric structure from quantitative satellite data
[AD-A078980] N80-19738

EARTH MANTLE
Body and surface wave modeling of observed seismic events
[AD-A078056] N80-19694

EARTH RESOURCES
Energy from the west: Impact analysis report. Volume 2. Site-specific and regional impact analyses
[PB80-113574] N80-19805
Conference of Remote Sensing Educators (CORSE-78)
[NASA-CP-2102] N80-20003

EARTH SURFACE
Radar altimeter measurements N80-19368
A laser profilometer for digital terrain mapping N80-19369
Statistical analysis of terrain and water (ice) backgrounds in a winter scene from northern Michigan
[AD-A077554] N80-19398
Climatic chamber tests of a surface ice accretion measurement system
[AD-A077022] N80-19725

ECHO SOUNDING
The evaluation of dull beam echo sounders in hydrographic surveying
[AD-A078273] N80-19747

ECOLOGY
LANDSAT digital analysis of the initial recovery of the Kokolik River tundra fire area, Alaska
[E80-10080] N80-19588
Bruneau Known Geothermal Resource Area: An environmental analysis
[EGG-GTH-5004] N80-19602
Research on dynamics of tundra ecosystems and their potential response to energy resource development
[DOE/SF-01525-1] N80-19642
Alaskan environmental research. Section 12.0 of part 2: Ecological sciences
[PNL-2850-PT-2-SUPPL] N80-19886

ECONOMETRICS
Performance measurement system: Recent systems development and applications
[HEDL-SA-1826-FP] N80-19924

EDGES
Theory of edge detection
[AD-A078063] N80-19941

EDITING
The levels of edit, second edition
[NASA-CR-162880] N80-19983

EDUCATION
Conference of Remote Sensing Educators (CORSE-78)
[NASA-CP-2102] N80-20003
History and future of remote sensing technology and education N80-20004
Is remote sensing far out? N80-20005
The attributes of a well-trained remote sensing technologist N80-20006
A multidisciplinary approach to remote sensing education N80-20007

Remote sensing research activities related to academic institutions N80-20008
NASA programs in technology transfer and their relation to remote sensing education N80-20009
NASA's western regional applications training activity N80-20010
Opportunities and problems in introducing or expanding the teaching of remote sensing in universities N80-20011
The use of multimedia and programmed teaching machines for remote sensing education N80-20012
Computer applications in remote sensing education N80-20013
Textbooks and technical references for remote sensing N80-20014
Data reduction by computer processing N80-20016
The reduction of remote sensing data by visual means — education N80-20017

EFFICIENCY
The space science data service: A study of its efficiencies and costs
[NASA-TM-80790] N80-19982

EIGENVALUES
Balancing the generalized eigenvalue problem
[ORNL/CSD-47] N80-19910

EIGENVECTORS
Numerical analysis of rafts on visco-elastic media using eigenvector expansions
[PB80-112507] N80-19570

EJECTION SEATS
Microprocessor controlled ejection seat
[AD-A077479] N80-19049
Prototype development passive, seat-mounted limb retention system
[AD-A076331] N80-19053

ELASTIC BARS
Theory of twisted nonuniformly heated bars
[NASA-TM-75758] N80-19565

ELASTIC BODIES
Surface settlement of a finite elastic layer whose modulus increases linearly with depth
[PB80-112869] N80-19571

ELASTIC DAMPING
Report on the use of abatement techniques for problems related to vibrations and noise N80-19583

ELASTIC SCATTERING
The elastic and inelastic scattering of 0.8 GeV protons by Y-89 and Zr-90 N80-19934

ELASTOMERS
Surface chemical composition - depth profile of polyether polyurethaneureas as studied by FT-IR and ESCA
[AD-A078240] N80-19272
The effect of seawater on polymers
[AD-A077324] N80-19281
Investigation of thermoplastic elastomers as propellant binders
[AD-A078691] N80-19288

ELASTOPLASTICITY
An approximate finite-element method of stress analysis of non-axisymmetric bodies with elastic-plastic material behavior N80-19562

ELECTRIC BATTERIES
Investigations of the safety of Li/SOCl2 batteries
[AD-A077894] N80-19835
Survivability of remote site alternate energy systems. Volume 1: Survivability analysis
[AD-A078118] N80-19836

ELECTRIC CONNECTORS
Large space systems technology electronics: Data and power distribution N80-19168
FY-79 - development of fiber optics connector technology for large space systems N80-19170
Investigation of electroplated electrical contacts
[AD-A075353] N80-19434

ELECTRIC CONTACTS
Investigation of electroplated electrical contacts
[AD-A075353] N80-19434
Testing the contact characteristics of electro-deposited coatings, part 1 — corrosion tests
[BLL-RTS-11806] N80-19514
Development of economical improved thick film solar cell contact
[NASA-CR-162849] N80-19619

ELECTRIC DIPOLES
Surface fields and radiation patterns of a vertical electric dipole over a radially varying ground system N80-19348

ELECTRIC DISCHARGES
Langmuir probe measurements of double-layers in a pulsed discharge
[NASA-CR-162845] N80-19954

ELECTRIC EQUIPMENT
Assessment of Carbon Fiber Electrical Effects
[NASA-CP-2119] N80-19193
Approach to the assessment of the hazard — fire released carbon fiber electrical effects N80-19194
Evaluation of equipment vulnerability and potential shock hazards — carbon fibers N80-19197
Large-scale fiber release and equipment exposure experiments — aircraft fires N80-19198
Surveys of facilities for the potential effects from the fallout of airborne graphite fibers N80-19199

ELECTRIC FIELDS
Electric field components in presence of a sea-sea bottom interface at ELF N80-19367
Diffraction phenomena during multipath fading N80-19371

ELECTRIC GENERATORS
Power system control study. Phase 1: Integrated control techniques
[AD-A079829] N80-19125
A linear magnetic motor/generator — to generate electric energy using magnetic flux for spacecraft's power supply
[NASA-CASE-GSC-12518-1] N80-19424

ELECTRIC MOTORS
A mathematical investigation of the dynamic resistance of a DC electrical machine N80-19422
A linear magnetic motor/generator — to generate electric energy using magnetic flux for spacecraft's power supply
[NASA-CASE-GSC-12518-1] N80-19424

ELECTRIC POTENTIAL
Development of mathematical models for solid state switching devices
[NASA-CR-161387] N80-19426
Studies of silicon p-n junction solar cells
[NASA-CR-162832] N80-19609

ELECTRIC POWER PLANTS
Regional systems development for geothermal energy resources. Pacific region: California and Hawaii. Task 1: Implementation plan development — for the generation of electric power
[DOE/ET-28432-1] N80-19604
Regional systems development for geothermal energy resources. Pacific region: California and Hawaii. Task 2: Regional program monitoring and progress evaluation — for the generation of electric power
[DOE/ET-28432-2] N80-19605
Regional systems development for geothermal energy resources. Pacific region: California and Hawaii. Task 3: Water resources evaluation — for generation of electric power
[DOE/ET-28432-3/1] N80-19606
Regional systems development for geothermal energy resources. Pacific region: (California and Hawaii). Task 3: Water resources evaluation, appendices — for generation of electric power
[DOE/ET-28432-3/2] N80-19607
Cogeneration Technology Alternatives Study (CTAS). Volume 1: Summary
[NASA-TM-81400] N80-19626
The effects of regional insolation differences upon advanced solar thermal electric power plant performance and energy costs
[NASA-CR-162886] N80-19634
Solar sea power plants. Citations from the NTIS data base
[PB80-802580] N80-19661
Solar seapower plants. Citations from the Engineering Index data base
[PB80-802598] N80-19662

ELECTRIC POWER SUPPLIES
A new approach to the design of highly efficient regulated dc-to-dc converters
[AD-A078627] N80-19440

ELECTRIC POWER TRANSMISSION
Flat bus fault sensors
[AD-A077060] N80-19435

ELECTRIC SWITCHES
Solid-state switch modeling N80-19189

ELECTRICAL ENGINEERING
Computer simulation model of the logistic support system for electrical engineering test equipment N80-19560
Annual review of research under the joint service electronics program
[AD-A077852] N80-20019

ELECTRICAL FAULTS
Evaluation of equipment vulnerability and potential shock hazards — carbon fibers N80-19197
Surveys of facilities for the potential effects from the fallout of airborne graphite fibers N80-19199

ELECTRICAL GROUNDING
Ground systems for HF antennas
[AD-A077691] N80-19339

ELECTRICAL INSULATION
Effects of carbon/graphite fiber contamination on high voltage electrical insulation N80-19203

ELECTRICAL RESISTANCE
A mathematical investigation of the dynamic resistance of a DC electrical machine N80-19422

ELECTRICAL RESISTIVITY
Highly conducting iodinated fluoroaluminum and fluorogallium phthalocyanine polymers
[AD-A079186] N80-19273
Detection of a normal zone in inductively coupled superconducting coils
[UCRL-83307] N80-19446

ELECTRO-OPTICS
Photometry of artificial satellites application to the Ground Electro-Optical Deep Space Surveillance (GEODSS) program
[AD-A078675] N80-19176

ELECTROCATALYSTS
Optimization of Pt-doped Kocite (trade name) electrodes in H3Po4 fuel cells
[AD-A075372] N80-19639

ELECTROCHEMISTRY
Photochemical transients of electrode bound methylene blue
[AD-A078908] N80-19218
Electrochemistry of solutes in chloroaluminate melts and the development of related electrochemical methodology
[AD-A078242] N80-19223

ELECTRODEPOSITION
Practical electroplating properties of electrochemically deposited metal and alloy coatings. Part 1: Gold and gold alloys
[BLL-TRS-11923] N80-19233
Stability to heat treatment of nickel-manganese deposits containing sulphur
[BLL-RTS-11591] N80-19234

ELECTRODES
Optimization of Pt-doped Kocite (trade name) electrodes in H3Po4 fuel cells
[AD-A075372] N80-19639

ELECTRODYNAMICS
A mathematical investigation of the dynamic resistance of a DC electrical machine N80-19422

ELECTROFORMING
Electrostatic forming N80-19154

ELECTROLYSIS
Thermochemical processes for hydrogen production
[LA-7937-PR] N80-19299
Electrolysis-based hydrogen storage systems overview and rationale of the Brookhaven National Laboratory managed program
[BNL-26904] N80-19654

ELECTROMAGNETIC FIELDS
Fields from a vertical magnetic dipole
[SAND-79-0449] N80-19695

ELECTROMAGNETIC INTERFERENCE
Atmospheric electricity and military operations
[AD-A078482] N80-19693

ELECTROMAGNETIC MEASUREMENT
Surface measuring technique — using a laser to scan the surface of a reflector N80-19155
Definition of subsurface features by geophysical probing N80-19408

ELECTROMAGNETIC PULSES
Loran-C pulse transient propagation. Part 1: Geophysical and geological data base evaluation for Loran-C ground wave propagation medium. Part 2: Loran-C ground wave secondary phase corrections over nonhomogeneous propagation techniques. Part 3: An experimental program to measure ECD and test the transient solution, with addendum
[AD-A077551] N80-19058

ELECTROMAGNETIC RADIATION
Field resonance propulsion concept
[NASA-TM-80961] N80-19184

Electromagnetic transmission through a filled slit of arbitrary cross section in a conducting plane of finite thickness
[AD-A078477] N80-19340

Ray optical description of waves guided by integrated dielectric cylinder-cone structures
[AD-A076344] N80-19343

Diffraction phenomena during multipath fading N80-19371

ELECTROMAGNETIC SCATTERING

Scattered radiation fields from rough surfaces full wave solutions N80-19356

Theoretical aspects of transient radiation and scattering in lossless two medium half spaces N80-19357

On the influence of surface statistics, ground moisture content and wave polarization on the scattering of irregular terrain and on signal power spectra N80-19359

Sea-state directional spectra observed by HF Doppler radar N80-19401

ELECTROMAGNETIC SHIELDING

Electromagnetic shielding of structural foams by using internal conductive materials
[AD-A078718] N80-19329

ELECTROMAGNETIC SURFACE WAVES

Airborne measurements of electromagnetic wave reflections from land and sea water N80-19355

Scattered radiation fields from rough surfaces full wave solutions N80-19356

ELECTROMAGNETIC WAVE TRANSMISSION

Some of the problems in digital terrain model construction N80-19361

Biological and geophysical factors of electromagnetic wave propagation and their use in digital data banks N80-19363

Electric field components in presence of a sea-sea bottom interface at ELF N80-19367

Mode converters for HF tunnels transmission N80-19406

Effective use of natural modes in VHF and UHF tunnel propagation N80-19411

ELECTRON BEAMS

Coupled cavity traveling wave tube with velocity tapering
[NASA-CASE-LEW-12296-1] N80-19425

Dual beam dual mode TWT
[AD-A077576] N80-19433

ELECTRON CYCLOTRON HEATING

Theory of electron cyclotron resonance heating of Tokamak plasmas
[AD-A075362] N80-19957

ELECTRON DENSITY (CONCENTRATION)

Model computations of radio wave scintillation caused by equatorial bubbles
[AD-A077028] N80-19690

ELECTRON DENSITY PROFILES

Methods of determining ionospheric structure from oblique sounding data N80-19364

Measurement of electron densities in the middle atmosphere using rocket borne blunt probes
[AD-A078148] N80-19686

ELECTRON EMISSION

Characterization of tungsten dispenser cathodes using ISS and SIMS
[AD-A077592] N80-19428

ELECTRON ENERGY

Determinations of electronic states in crystalline semiconductors and metals by angle-resolved photoemission
[LBL-9429] N80-19972

ELECTRON PRECIPITATION

Coordinated field operation of balloon-borne auroral X-ray experiment from the ATS-F satellite conjugate region
[AD-A078041] N80-19685

ELECTRON SOURCES

Cluster effects on charge state distributions for heavy ion molecular beams
[BNL-26765] N80-19930

ELECTRON SPECTROSCOPY

Design, construction and testing of a magnetic electron spectrometer for detecting electrons to 10 MeV, including a preliminary design for a flight unit
[AD-A078516] N80-19472

ELECTRON TUBES

I/J band low-cost crossed-field amplifier
[AD-A077322] N80-19436

ELECTRONIC CONTROL

Annual review of research under the joint service electronics program
[AD-A077652] N80-20019

ELECTRONIC COUNTERMEASURES

The F-16 Wild Weasel: A feasibility study
[AD-A077090] N80-19071

ELECTRONIC EQUIPMENT

A new approach to maintainability prediction — avionics, ground, and shipboard electronics N80-19537

Reliability growth through environmental simulation — electronic equipment N80-19538

ELECTRONIC EQUIPMENT TESTS

Research in remote signal transmission electronics
[ORNL/SUB-7644/10] N80-19444

The increase of the reliability of electronic equipment subject to reliability clauses N80-19529

ELECTRONIC FILTERS

Analog binary programmable transversal filter
[AD-A078960] N80-19437

ELECTRONS

Testing quantum chromodynamics in electron-positron annihilation at high energies
[DOE/ER-01388-777] N80-19938

ELECTROPHORESIS

Isoelectric focusing of red blood cells in a density gradient stabilized column
[NASA-TM-78258] N80-19217

Kidney cell electrophoresis
[NASA-CR-160555] N80-19782

ELECTROPLATING

Mechanical properties of electroplated nickel rings for bath aging study
[BDX-613-2303] N80-19256

Activation by means of colloidal palladium in the electroplating of ABS copolymers. 2: The nature of the palladium/tin (2) chloride activating solution
[BLL-RTS-11924] N80-19261

Investigation of electroplated electrical contacts
[AD-A075363] N80-19434

Testing the contact characteristics of electro-deposited coatings, part 1 — corrosion tests
[BLL-RTS-11908] N80-19514

ELECTROSTATIC PRECIPITATORS

Electrostatic precipitations for collection of high resistivity ash
[PB80-112288] N80-19571

ELECTROSTATIC PROBES

Langmuir probe measurements of double-layers in a pulsed discharge
[NASA-CR-162845] N80-19954

Magnetosheath effects on cylindrical Langmuir probes
[NASA-CR-162852] N80-19958

ELLIPTIC DIFFERENTIAL EQUATIONS

Finite element method for the triconi problem
[ORO-3443-84] N80-19911

EMERGENCIES

Aircraft emergency decisions: Cognitive and situational variables
[AD-A077413] N80-19051

EMISSION SPECTRA

Characteristics of the background emission spectrum from a miniature ICP
[AD-A077676] N80-19955

ENCAPSULATING

Develop silicone encapsulation systems for terrestrial silicon solar arrays
[NASA-CR-162840] N80-19517

Glass for low-cost photovoltaic solar arrays
[NASA-CR-162985] N80-19533

ENDOTHELIUM

A continuum model of protein transport across the endothelium in the lungs and in the body of humans N80-19778

ENDOTHERMIC REACTIONS

Thermochemical processes for hydrogen production
[LA-7937-PR] N80-19299

ENERGY CONSERVATION

Energy conservation in the U.S. economy from increased recycle of obsolete steel scrap N80-19492

ENERGY CONSUMPTION

Energy accounting for solar and alternative energy sources
[ORAU/IEA(R)-79-11] N80-19647

ENERGY CONVERSION

Potential of biomass conversion in meeting the energy needs of the rural populations of developing countries: An overview
[BNL-26721] N80-19294

General reliability and safety methodology and its application to wind energy conversion systems
[SERI/TR-95-234] N80-19645

Screening evaluation of electric power cycles integrated with coal gasification plants
[EPRI-AF-1180] N80-19648

Environmental and economic evaluations of energy recovery from agricultural and forestry residues
[ANL/EES/TM-58] N80-19669

ENERGY CONVERSION EFFICIENCY

Studies of silicon p-n junction solar cells
[NASA-CR-162832] N80-19609

LSA field test
[NASA-CR-162798] N80-19611

The effects of regional insolation differences upon advanced solar thermal electric power plant performance and energy costs
[NASA-CR-162896] N80-19634

ENERGY DISTRIBUTION

Empirical studies of solar flares: Comparison of X-ray and H alpha filtergrams and analysis of the energy balance of the X-ray plasma
[NASA-CR-161405] N80-20001

ENERGY GAPS (SOLID STATE)

Why do glassy materials possess energy gaps
[AD-A078668] N80-19986

ENERGY POLICY

Centrifugal fluidized combustion of coal
[FE-2516-9] N80-19293

Potential of biomass conversion in meeting the energy needs of the rural populations of developing countries: An overview
[BNL-26721] N80-19294

Energy conservation in the U.S. economy from increased recycle of obsolete steel scrap N80-19492

Teetered, tip-controlled rotor: Preliminary test results from Mod-0 100-kW experimental wind turbine
[NASA-TM-81445] N80-19613

Installation and checkout of the DOE/NASA Mod-1 2000-kW wind turbine generator
[NASA-TM-81444] N80-19614

High temperature solar thermal receiver
[NASA-CR-162831] N80-19621

Low cost point focus solar concentrator. Phase 1: Preliminary design
[JPL-9950-273] N80-19622

Low-costs point-focus solar concentrator, phase 1
[NASA-CR-162839] N80-19625

Thermal performance evaluation of the Northrop model NSC-01-0732 concentrating solar collector array at outdoor conditions — Marshall Space Flight Center solar house test facility
[NASA-CR-161254] N80-19628

Installation guidelines for solar heating system, single-family residence at New Castle, Pennsylvania
[NASA-CR-161355] N80-19630

Annual technical report, fiscal year 1979. Volume 1: Executive summary
[NASA-CR-158715] N80-19632

The effects of regional insolation differences upon advanced solar thermal electric power plant performance and energy costs
[NASA-CR-162896] N80-19634

On influencing the operating temperatures of Motorola and Arco solar photovoltaic modules
[COO-4094-59] N80-19649

Energy from the west: Impact analysis report. Volume 2. Site-specific and regional impact analyses
[PB80-113574] N80-19655

ENERGY REQUIREMENTS

Orbiter fuel cell performance constraints. STS/OPS Pratt Whitney fuel cells. Operating limits for mission planning
[NASA-TM-80958] N80-19610

Modeling the space conditioning energy demand of a community as a function of weather
[COO-1340-65] N80-19644

ENERGY STORAGE

Development of a Fe-Pb(Ti) secondary battery system N80-19608

Lithium battery storage and discharge tests
[SAND-79-0869C] N80-19643

Electrolysis-based hydrogen storage systems overview and rationale of the Brookhaven National Laboratory managed program
[BNL-28904] N80-19654

ENERGY TECHNOLOGY
Mixing and gasification of coal in entraining flow systems
[FE-2886-T1] N80-19303
Advanced technology light weight fuel cell program — orbiting space vehicle long-life hydrogen oxygen fuel cell
[NASA-CR-159807] N80-19615
Develop silicone encapsulation systems for terrestrial silicon solar arrays
[NASA-CR-162840] N80-19617
High temperature solar thermal receiver
[NASA-CR-162831] N80-19621
Cogeneration Technology Alternatives Study (CTAS). Volume 1: Summary
[NASA-TM-81400] N80-19626
Wave power extraction by floating bodies
[AD-A079058] N80-19637
Solar powered liquid piston Stirling cycle irrigation pump
[SAN/1894-1] N80-19641
Research on dynamics of tundra ecosystems and their potential response to energy resource development
[DOE/SF-01525-1] N80-19642
Energy accounting for solar and alternative energy sources
[ORAU/IEA(R)-79-11] N80-19647
Characterization and assessment of selected solar thermal energy systems for residential and process heat applications
[LA-7995-TASE] N80-19648
Cataract hydroelectric development expansion study
[DOE/ID-01796-1] N80-19650
Potential hydroelectric power, vertical turbine, spillway combine Broadwater Dam
[DOE/ID-01622-1] N80-19651
Emerging materials systems for solar cell applications-Cu/sub 2-x/Se
[DOE/ET-23005-T2] N80-19653
Energy from the west: Impact analysis report. Volume 2. Site-specific and regional impact analyses
[PB80-113574] N80-19655
Cadmium sulfide solar cells, volume 1. Citations from the NTIS data base
[PB80-802218] N80-19656
Solar electric power generation, volume 3. Citations from the Engineering Index data base
[PB80-803034] N80-19657
Solar electric power generation, volume 2. Citations from the NTIS data base
[PB80-803000] N80-19658
Solar electric power generation, volume 3. Citations from the NTIS data base
[PB80-803018] N80-19659
Solar electric power generation, volume 2. Citations from the Engineering Index data base
[PB80-803026] N80-19660
Solar sea power plants. Citations from the NTIS data base
[PB80-802580] N80-19661
Solar seapower plants. Citations from the Engineering Index data base
[PB80-802598] N80-19662

ENERGY TRANSFER
Wave power extraction by floating bodies
[AD-A079058] N80-19637

ENGINE ANALYZERS
An analysis and synthesis of engine condition monitoring systems
[AD-A077531] N80-19122

ENGINE DESIGN
The 4th International Symposium on Air Breathing Engines
[AD-A079856] N80-19114
Novel ceramic turbine rotor concepts
[AD-A079889] N80-19118
Minature synchronous motors with permanent magnet rotors
[BLL-RTS-11801] N80-19423
A 15 kWe (nominal) solar thermal-electric power conversion concept definition study: Steam Rankin reciprocator system
[NASA-CR-159591] N80-19612

ENGINE FAILURE
Ferrographic and spectrographic analysis of oil sampled before and after failure of a jet engine
[NASA-TM-81430] N80-19497

ENGINE MONITORING INSTRUMENTS
An analysis and synthesis of engine condition monitoring systems
[AD-A077531] N80-19122

ENGINE NOISE
Methods of sound simulation and applications in flight simulators
[NASA-TM-75768] N80-19130

ENGINE PARTS
Contribution of photoelastic analysis to the study of turbo-engine components
[BR71985] N80-19112

ENGINE STARTERS
Power system control study. Phase 1: Integrated control techniques
[AD-A079829] N80-19125

ENGINE TESTS
Tests of an improved rotating stall control system on a J-85 turbojet engine
[AD-A077704] N80-19109
Contribution of photoelastic analysis to the study of turbo-engine components
[BR71985] N80-19112
Diesel engine endurance test with water-containing fire-resistant fuel
[AD-A079665] N80-19267
Experimental investigation into the heat flux in the piston and cylinder liner of a high-speed diesel engine
[BLL-RTS-11902] N80-19494

ENGLISH CHANNEL
Sea surface temperature of the coastal zones of France. Heat Capacity Mapping Mission (HCMM)
[E80-10057] N80-19585

ENTRAINMENT
Mixing and gasification of coal in entraining flow systems
[FE-2886-T1] N80-19303

ENVIRONMENT EFFECTS
Methanol as a transportation fuel: Assessment of environmental and health research
[UCRL-52897] N80-19295
Environmental assessment of the HYGAS process. Volume 1: HYGAS environmental characterization, data synthesis, analysis, and interpretation, tests 37 - 64
[FE-2433-25-VOL-1] N80-19305
LANDSAT digital analysis of the initial recovery of the Kokolik River tundra fire area, Alaska
[E80-10080] N80-19588
Use of remote sensing for land use policy formulation — Kalamazoo, Lake, Mecosta, Newaygo, Osceola, and Wexford counties, Michigan
[E80-10085] N80-19592
Brunsau Known Geothermal Resource Area: An environmental analysis
[EGG-GTH-5004] N80-19602
Research on dynamics of tundra ecosystems and their potential response to energy resource development
[DOE/SF-01525-1] N80-19642
Energy from the west: Impact analysis report. Volume 2. Site-specific and regional impact analyses
[PB80-113574] N80-19655
Alaskan environmental research. Section 12.0 of part 2: Ecological sciences
[PNL-2950-PT-2-SUPPL] N80-19686
Nuclear waste management technology development activities
[LA-7921-PR] N80-19937

ENVIRONMENT POLLUTION
Application of coke plant control technologies to coal conversion
[PB80-108954] N80-19310

ENVIRONMENT SIMULATION
Reliability growth through environmental simulation — electronic equipment N80-19538
Climatic chamber tests of a surface ice accretion measurement system
[AD-A077022] N80-19725

ENVIRONMENTAL CONTROL
Weather modification effects and management. A bibliography with abstracts
[PB80-802796] N80-19744

ENVIRONMENTAL MONITORING
NOAA satellite monitoring of snow cover in the Northern Hemisphere during the winter of 1977 N80-19584

ENVIRONMENTAL TESTS
Dynamic environments and test simulation for qualification of aircraft equipment and external stores N80-19092
Civil aircraft equipment environment qualification techniques N80-19093
Reliability growth through environmental simulation — electronic equipment N80-19538

EPITAXY
VPE growth of (Al, Ga)As
[AD-A078264] N80-19967
Characterization of LPE grown HgCdTe by ion scattering spectrometry
[AD-A077884] N80-19988

EPOXY RESINS
Failure analysis and resin evaluation if IUS SRM-1 92 inch prototype motor case
[AD-A077407] N80-19189
Moisture effects on the mechanical properties of Hercules 3501-6 epoxy resin
[AD-A079616] N80-19282

EQUATORIAL ATMOSPHERE
Transequatorial propagation through equatorial plasma bubbles: Discrete events N80-19393
The phenomenology of transequatorial radio propagation under spread-F conditions N80-19394
Detection, ranging and driftspeed measurements of equatorial ionospheric irregularities by means of airglow observations N80-19395
Model computations of radio wave scintillation caused by equatorial bubbles
[AD-A077028] N80-19690

EQUIPMENT SPECIFICATIONS
Comparison of specifications for Head-Up Displays in the Navy A-4M, A-7E, AV-8A, and F-14A aircraft
[AD-A080047] N80-19108

EROSIVE BURNING
Turbulent boundary-layer analysis and experimental investigation of erosive burning problem of composite solid propellants
[AD-A077351] N80-19289

ERROR ANALYSIS
Analytical software verification N80-19552
Software quality and its assurance N80-19553

ERROR DETECTION CODES
An analysis of software reliability prediction models N80-19551

ERYTHROCYTES
Isoelectric focusing of red blood cells in a density gradient stabilized column
[NASA-TM-78258] N80-19217
Studies of the effects of stationary magnetic fields on rat erythron N80-19777

ESTIMATES
Combining and updating of local estimates and regional maps along sets of one-dimensional tracks
[AD-A080034] N80-19902

ESTIMATING
A computer program for estimating aircraft landing distance
[AD-A077169] N80-19088
Equilibrium temperatures in self-contained bearing assemblies. Part 5: Examples of the complete method — method of estimating the temperature rise in a bearing assembly
[ESDU-79002] N80-19493
Fast estimation of three parameters of Weibull law N80-19526
A density-quantile function approach to choosing order statistics for the estimation of location and scale parameters N80-19915

ESTUARIES
Sea surface temperature of the coastal zones of France. Heat Capacity Mapping Mission (HCMM)
[E80-10057] N80-19585

EUTROPHICATION
Non-point source - stream nutrient level relationships: A nationwide study. Supplement 1: Nutrient map reliability
[PB80-112691] N80-19679

EXCITATION
Excitation of the HF surface wave by vertical and horizontal apertures N80-19410

EXHAUST EMISSION
Issues concerning the light-duty diesel
[DOE/EV-0050/1] N80-19510

Development of an emission inventory quality assurance program
[PB80-112345] N80-19673
Sources of atmospheric cadmium
[PB80-121221] N80-19677

EXHAUST GASES
Bipropellant engine plume contamination program. Volume 2: Chamber measurements, phase 2
[AD-A077435] N80-19187
Bipropellant engine plume contamination program. Volume 1: Chamber measurements, phase 1
[AD-A078412] N80-19188

EXOBIOLOGY
USSR report: Space biology and aerospace medicine, v. 14, no.1
[JPRS-75251] N80-19755
Aerospace medicine and biology: A continuing bibliography with indexes, supplement 203
[NASA-SP-7011(203)] N80-19779
Aerospace medicine and biology: A continuing bibliography with indexes, supplement 204
[NASA-SP-7011(204)] N80-19781

EXPANSION
An analysis of residual stresses and displacements due to radial expansion of fastener holes
[AD-A076370] N80-19569

EXPERIMENTAL DESIGN
Hypersonic interference flow flight experiment design — investigating aerodynamic heating and loads
[AD-A078661] N80-19044
Investigation of electroplated electrical contacts
[AD-A075353] N80-19434
Gravitational redshift space-probe experiment
[NASA-CR-161409] N80-19999

EXPLOSIONS
Effects of artillery noise on the hearing of protected crew personnel
[AD-A078664] N80-19805

EXTERNAL STORES
Dynamic environments and test simulation for qualification of aircraft equipment and external stores
N80-19092

EXTREMELY LOW FREQUENCIES
Electric field components in presence of a sea-sea bottom interface at ELF N80-19367

F

F 2 REGION
Basic findings helpful for ionospheric predictions — lunar tides in the F region N80-19387

F-4 AIRCRAFT
Wind tunnel test to investigate aerodynamic hysteresis phenomena of the F-4 and F-11 aircraft models
[AD-A077196] N80-19040
Avionics interface data summaries: A-10A, EF-111A, F-43, F-4G, F-15A, F-16A, F-111A, F-111E, F-111F, RF-4C
[AD-A077388] N80-19105

F-15 AIRCRAFT
Avionics interface data summaries: A-10A, EF-111A, F-43, F-4G, F-15A, F-16A, F-111A, F-111E, F-111F, RF-4C
[AD-A077388] N80-19105

F-16 AIRCRAFT
The F-16 Wild Weasel: A feasibility study
[AD-A077050] N80-19071
Avionics interface data summaries: A-10A, EF-111A, F-43, F-4G, F-15A, F-16A, F-111A, F-111E, F-111F, RF-4C
[AD-A077388] N80-19105
The reliability improvement warranty and its application to the F-16 multinational fighter program
N80-19561

F-111 AIRCRAFT
Wind tunnel test to investigate aerodynamic hysteresis phenomena of the F-4 and F-11 aircraft models
[AD-A077196] N80-19040
Thrust vectoring to eliminate the vertical stabilizer — to provide directional stability for f-111 aircraft while decreasing radar detectability
[AD-A079852] N80-19077
Avionics interface data summaries: A-10A, EF-111A, F-43, F-4G, F-15A, F-16A, F-111A, F-111E, F-111F, RF-4C
[AD-A077388] N80-19105

FABRICATION
Structural assembly in space N80-19139
Surface Acoustic Waves: Experimental device fabrication
[BBC-RD-1979/29] N80-19928
Optical channel waveguide arrays coupled to integrated charge-coupled devices and their applications
[AD-A077284] N80-19949

FACTORIAL DESIGN
Robust methods for factorial experiments with outliers
[AD-A077890] N80-19921

FAILURE ANALYSIS
Failure analysis and resin evaluation if IUS SRM-1 92 inch prototype motor case
[AD-A077407] N80-19189
Ferrographic and spectrographic analysis of oil sampled before and after failure of a jet engine
[NASA-TM-81430] N80-19497
A simulation program for the determination of system reliability of complex avionic systems N80-19523

FAR FIELDS
Far field conditions for subsonic flows with small superimposed harmonic oscillations
[AD-A077693] N80-19043

FARMLANDS
Use of remote sensing for land use policy formulation — Kalamazoo, Lake, Mecosta, Newaygo, Osceola, and Wexford counties, Michigan
[E80-10085] N80-19592

FASTENERS
Fastener hole quality, volume 1 — design analysis of fatigue life and drilling techniques for fasteners in aircraft production
[AD-A077858] N80-19567
An analysis of residual stresses and displacements due to radial expansion of fastener holes
[AD-A076370] N80-19569

FATIGUE (MATERIALS)
The corrosion fatigue behavior of a high purity Al-Zn-Mg-Cu alloy
[AD-A077451] N80-19247

FATIGUE LIFE
Effects of proof-test on the strength and fatigue life of a unidirectional composite
[AD-A076334] N80-19211
Fastener hole quality, volume 1 — design analysis of fatigue life and drilling techniques for fasteners in aircraft production
[AD-A077858] N80-19567

FATIGUE TESTS
Fatigue strength of trip steels
[AD-A078562] N80-19245
Evaluation of dynamically riveted joints
[AD-A077223] N80-19504

FEEDBACK CONTROL
Closed loop models for analyzing engineering requirements for simulators
[NASA-CR-2965] N80-19063
Closed loop aspects of aircraft identification
N80-19104
Tests of an improved rotating stall control system on a J-85 turbojet engine
[AD-A077704] N80-19109
Variable cycle engine multivariable control synthesis: Control structure definition
[AD-A078670] N80-19117
Biofeedback. A bibliography with abstracts
[PB80-803117] N80-19790
Design of optimal tracking discrete control system
[AD-A078751] N80-19890

FEEDFORWARD CONTROL
Application of the concept of dynamic trim control to automatic landing of carrier aircraft — utilizing digital feedforward control
[NASA-TP-1512] N80-19126

FEVER
Distinctions in development of pyrogenal fever in animals following prolonged hypokinesia
N80-19765

FIBER COMPOSITES
Failure analysis and resin evaluation if IUS SRM-1 92 inch prototype motor case
[AD-A077407] N80-19189
Assessment of risk due to the use of carbon fiber composites in commercial and general aviation
N80-19201
Perspective on the results N80-19202

FIBER OPTICS
FY-79 - development of fiber optics connector technology for large space systems N80-19170
Forecast analysis of optical waveguide bus performance
[NASA-CR-162851] N80-19942

FIBER ORIENTATION
Determination of the technical constants of laminates in oblique directions
[NASA-TM-75719] N80-19267

FIBER STRENGTH
Effects of proof-test on the strength and fatigue life of a unidirectional composite
[AD-A076334] N80-19211

FIBROBLASTS
Study of radioprotective effect of high-intensity magnetic fields on mammalian cell cultures
N80-19776

FIELD EFFECT TRANSISTORS
Monolithic microwave preamplifier
[AD-A078522] N80-19441

FIELD STRENGTH
Ground systems for HF antennas
[AD-A077691] N80-19339
Theories of ground wave propagation over mixed paths N80-19350

FIELD THEORY (PHYSICS)
Field theory of pion-nucleus interactions
[DOE/ER-01388-775] N80-19901

FIGHTER AIRCRAFT
Measuring technological change in jet fighter aircraft
[AD-A077393] N80-19084
Identification experience in extreme flight regimes
N80-19102
Air-to-air engagement simulation N80-19834
Fire control for air-to-air gunnery in high performance fighter aircraft N80-19841

FINITE DIFFERENCE THEORY
The calculation of momentum and heat transfer in internal flows and in flows with small regions of separation
[AD-A078454] N80-19458

FINITE ELEMENT METHOD
An approximate finite-element method of stress analysis of non-axisymmetric bodies with elastic-plastic material behavior N80-19562
Numerical analysis of rafts on visco-elastic media using eigenvector expansions
[PB80-112907] N80-19570
Finite element method for the tricomi problem
[ORO-3443-84] N80-19911

FIRE CONTROL
Fire control for air-to-air gunnery in high performance fighter aircraft N80-19841

FIRE DAMAGE
LANDSAT digital analysis of the initial recovery of the Kokolik River tundra fire area, Alaska
[E80-10080] N80-19588

FIRE FIGHTING
Project FIRES - Firefighters Integrated Response Equipment System. Volume 1: Program overview and summary, phase 1A
[NASA-CR-161399] N80-19795
Project FIRES - Firefighters Integrated Response Equipment System. Volume 2: Protective ensemble performance standards goals for firefighter protection, phase 1A
[NASA-CR-161400] N80-19796
Project FIRES - Firefighters Integrated Response Equipment System. Volume 3: Test and evaluation report, phase 1A
[NASA-CR-161401] N80-19797
Project FIRES - Firefighters Integrated Response Equipment System. Volume 4: Technology demonstration ensemble, phase 1A
[NASA-CR-161402] N80-19798
Project FIRES - Firefighters Integrated Response Equipment System. Volume 5: Prototype protective ensemble data package, phase 1A
[NASA-CR-161403] N80-19799

FIRES
Propulsion and energetics panel Working Group 11 on aircraft fire safety. Volume 2: Main report
[AGARD-AR-132-VOL-2] N80-19047
Assessment of Carbon Fiber Electrical Effects
[NASA-CP-2119] N80-19193
Approach to the assessment of the hazard — fire released carbon fiber electrical effects N80-19194

Release of carbon fibers from burning composites N80-19195
Dissemination, resuspension, and filtration of carbon fibers — aircraft fires N80-19196
Large-scale fiber release and equipment exposure experiments — aircraft fires N80-19199

FLAME PROPAGATION
Evaluation of a locally homogeneous flow model of spray combustion [NASA-CR-3292] N80-19283
Two dimensional convective flamespreading in packed beds of granular propellant — using digital simulation [AD-A075326] N80-19285

FLAME RETARDANTS
Diesel engine endurance test with water-containing fire-resistant fuel [AD-A078685] N80-19287

FLAME SPECTROSCOPY
An improved dispersion system for simultaneous multielement analysis by flame spectroscopy N80-19215

FLAME STABILITY
Turbulence, combustion, pollutant, and stability characterization of a premixed, step combustor [NASA-CR-3230] N80-19108
An analysis of turbulent diffusion flame in axisymmetric jet [NASA-CR-162684] N80-19449

FLAMES
Solid propellant combustion mechanism research [AD-A078831] N80-19301

FLAMMABILITY
Diesel engine endurance test with water-containing fire-resistant fuel [AD-A078685] N80-19287

FLAT PLATES
Wall pressure fluctuations during transition on a flat plate [AD-A075379] N80-19005

FLEXIBLE BODIES
Flexible materials technology N80-19171

FLIGHT CHARACTERISTICS
Proceedings of a Workshop on V/STOL Aircraft Aerodynamics, volume 2 — conferences [AD-A078909] N80-19042
Development of VTOL flying qualities criteria for low speed and hover [AD-A078911] N80-19085
Parameter Identification — conference on techniques applied to aircraft flight test data [AGARD-LS-104] N80-19094
Aircraft parameter identification methods and their applications: Survey and future aspects N80-19095
Identification evaluation methods N80-19096
Analysis of aircraft performance stability and control measures N80-19099
Wind tunnel and free flight model identification experience N80-19103
Closed loop aspects of aircraft identification N80-19104
Handling quality requirements for advanced aircraft design longitudinal mode [AD-A077858] N80-19128

FLIGHT CLOTHING
Lightweight pilot helmets: The issue of weight versus protection [AD-A076325] N80-19806

FLIGHT CONDITIONS
Aircraft icing during low-level flights [AD-A078643] N80-19052

FLIGHT CONTROL
Closed loop models for analyzing engineering requirements for simulators [NASA-CR-2965] N80-19063
Handling quality requirements for advanced aircraft design longitudinal mode [AD-A077858] N80-19128
Microprocessor control of low speed V/STOL flight [AD-A077861] N80-19129
Attitude control study for a large flexible spacecraft using a Solar Electric Propulsion System (SEPS) [NASA-CR-162678] N80-19183
Nonelectronic aspects of avionic system reliability — actuation N80-19535
Air Force Flight Dynamics Laboratory fiscal year 1981. Technical objective document [AD-A078973] N80-20020

FLIGHT CREWS
Evaluation and forecasting of mental fitness of flight personnel in the presence of nausea N80-19770
Human work measurement. A bibliography with abstracts [PB80-802198] N80-19807

FLIGHT HAZARDS
Aircraft icing during low-level flights [AD-A078643] N80-19052

FLIGHT INSTRUMENTS
Aspects of flight test instrumentation — methods to derive aircraft performance and stability and control characteristics N80-19099

FLIGHT PATHS
Flight path displays [AD-A077181] N80-19107

FLIGHT SIMULATION
Application of the Estimation-Before-Modeling (EBM) system identification method to the high angle of attack/sideslip flight of the T-2C jet trainer aircraft. Volume 2: Simulation study using T-2C wind tunnel model data [AD-A078923] N80-19061
Evaluation of aircraft windshield materials in a simulated supersonic flight environment [AD-A078673] N80-19082
Remarks on simulation. Objectives/areas of use/possibilities/limitations: An overview N80-19812
Simulation of a night vision system for low level helicopter operations — using helmet mounted display device N80-19832

FLIGHT SIMULATORS
Methods of sound simulation and applications in flight simulators [NASA-TM-75768] N80-19133
Design of a simulator for studying the helicopter - SIVEH N80-19829
Cost-effectiveness of flight simulators for military training N80-19830
Using a language developed for aircraft simulators — advantages and disadvantages of using FORTRAN and assembly language N80-19831

FLIGHT TESTS
Airborne radar approach system flight test experiment [AD-A077900] N80-19054
Preliminary Airworthiness Evaluation UH-1H helicopter equipped with Multiple Target Electronic Warfare System (MULTEWS) [AD-A078476] N80-19067
Application of the Estimation-Before-Modeling (EBM) system identification method to the high angle of attack/sideslip flight of the T-2C jet trainer aircraft. Volume 3: Identification of T-2C aerodynamics stability and control characteristics from actual flight test data [AD-A078924] N80-19072
Parameter Identification — conference on techniques applied to aircraft flight test data [AGARD-LS-104] N80-19094
Aspects of flight test instrumentation — methods to derive aircraft performance and stability and control characteristics N80-19098
Analysis of aircraft performance stability and control measures N80-19099

FLIGHT TRAINING
Aviation training using video disk technology N80-19828

FLIR DETECTORS
Intelligent tracking techniques — for FLIR and TV imagery [AD-A077869] N80-19943
GE-SI supersonic FLIR window [AD-A078371] N80-19948
Display Working Group Joint DARCOM/NMC/AFLC/AFSC Panel on the Field of Night Vision Technology — conferences [AD-A077061] N80-19951

FLOOD PLAINS
Multisensor analysis of hydrologic features in the Wind River Range, Wyoming with emphasis on the SEASAT SAR [E80-10063] N80-19591

FLORIDA
Solar energy system performance evaluation: Seasonal report for SEMCO, Loxahatchee, Florida [NASA-CR-161379] N80-19827

FLOW DISTRIBUTION
Far field conditions for subsonic flows with small superimposed harmonic oscillations [AD-A077693] N80-19043
Laser-Raman flow-field diagnostics of two large hypersonic test facilities [AD-A078289] N80-19135
An investigation of the quality of the flow generated by three types of wind tunnel (Ludwieg tube, Evans clean tunnel and injector driven tunnel) N80-19138

FLOW EQUATIONS
Viscous flow in the region of a rounded trailing edge [AD-A078588] N80-19045
Numerical integration of compressible, viscous flow equations [AD-A077558] N80-19457

FLOW MEASUREMENT
An investigation of the quality of the flow generated by three types of wind tunnel (Ludwieg tube, Evans clean tunnel and injector driven tunnel) N80-19138
Low velocity performance of a high speed vane anemometer [AD-A077457] N80-19475
Development of a laser-Doppler velocimeter for use in the aquatic environment N80-19479

FLOW VELOCITY
An analytical and experimental study of aircraft hydraulic lines including the effect of mean flow [AD-A079746] N80-19079
Ultrasonic Doppler directional blood flow velocity meter [RAE-LIB-TRANS-1918] N80-19780

FLOW VISUALIZATION
Visualization of unsteady jets and aerodynamic noise fields [CUED/A-TURBO/TR-96] N80-19029

FLUES
Analysis of thermal decomposition products of flue gas conditioning agents [PB80-111818] N80-19672

FLUID FILTERS
An RF oscillator for rocket-borne and balloon-borne quadrupole mass spectrometers [AD-A078787] N80-19473

FLUID FLOW
Rotary balance data for a typical single-engine general aviation design for an angle-of-attack range of 8 deg to 90 deg. 1: Low-wing model A — fluid flow and vortices data for general aviation aircraft to determine aerodynamic characteristics for various designs [NASA-CR-3100] N80-19030

FLUIDIZED BED PROCESSORS
Centrifugal fluidized combustion of coal [FE-2516-9] N80-19293
Coal processing fuel cell utilization. Task 8: H2S removal by calcium-based sorbents [PSI-TR-167] N80-19300
Fluid coking of coal liquefaction residues: The fourth residue [FE-2422-28] N80-19304
Development of a fast fluid bed gasifier, task 2 and 3 [FE-2361-40] N80-19306

FLUORO COMPOUNDS
Highly conducting iodinated fluoroaluminum and fluorogallium phthalocyanine polymers [AD-A078188] N80-19273

FLUTTER
Analysis of trunk flutter in an air cushion landing system [AD-A079008] N80-19075
Developing, mechanizing and testing of a digital active flutter suppression system for a modified B-52 wind-tunnel model [NASA-CR-159155] N80-19566
Some recent measurements of structural dynamic damping in aircraft structures N80-19578

FLUTTER ANALYSIS
Analysis of trunk flutter in an air cushion landing system [AD-A079008] N80-19075
Some recent measurements of structural dynamic damping in aircraft structures N80-19578

FLUX (RATE)
A theory of anomalous absorption, backscatter and flux limitation in laser produced plasmas [AD-A075350] N80-19956

A note on the revised galactic neutron spectrum of the Ames collaborative study
[NASA-CR-150554] N80-20002
FOAMS
Electromagnetic shielding of structural foams by using internal conductive materials
[AD-A078718] N80-19329
FOCI
Low cost point focus solar concentrator, phase 1
[NASA-CR-162948] N80-19624
FOCUSING
Optical channel waveguide arrays coupled to integrated charge-coupled devices and their applications
[AD-A077394] N80-19949
FOG
Fog dispersion — charged particle technique
[NASA-CR-3255] N80-19703
FOG DISPERSAL
Fog dispersion — charged particle technique
[NASA-CR-3255] N80-19703
FORCE
Reintroducing the concept of force into relativity theory
[ORO-3992-357] N80-19977
FORESTS
The RADOT code system to calculate the radar return from a forested area
[AD-A076471] N80-19333
FORGING
Exploratory development of die materials for isothermal forging of titanium alloys
[AD-A078951] N80-19249
FORMING TECHNIQUES
Modeling of the hot isostatic pressing process — for metal forming techniques with metal powder
[AD-A078162] N80-19502
FORTRAN
Using a language developed for aircraft simulators — advantages and disadvantages of using FORTRAN and assembly language N80-19831
FOURIER ANALYSIS
Theory of edge detection
[AD-A078063] N80-19941
FOURIER TRANSFORMATION
Fourier Transform Infrared Spectroscopy (FTIS). Volume 1: Technical Report — service life of solid rocket propellants
[AD-A078896] N80-19227
Fourier Transform Infrared Spectroscopy (FTIS). Volume 2: User's manual
[AD-A079997] N80-19228
Comparison of crystallinity and molecular orientation between surface and bulk of some polymers by FTIR-ATR and transmission spectroscopy — polyethylene and polypropylene
[AD-A078243] N80-19289
FRACTOGRAPHY
Failure causing defects in ceramics: What NDE should find
[AD-A078234] N80-19267
FRACTURE MECHANICS
USAF damage tolerant design handbook: Guidelines for the analysis and design of damage tolerant aircraft structures, revision A
[AD-A078216] N80-19085
Determination of test technique influence on K sub ISCC values for aluminum 7075-T651
[AD-A077453] N80-19242
Hydrogen effects on flow localization and fracture in type 304L stainless steel
[DP-MS-79-57] N80-19255
Failure causing defects in ceramics: What NDE should find
[AD-A078234] N80-19267
FRACTURE STRENGTH
Improved impact fracture resistance in oxidation-toughened SiGn4-20 vol% ZrO2
[AD-A078833] N80-19241
FRANCE
Sea surface temperature of the coastal zones of France. Heat Capacity Mapping Mission (HCMM)
[E80-10057] N80-19585
FREE ELECTRON LASERS
The theory of free electron lasers
[AD-A075363] N80-19482
FREE FLIGHT
Free-flight base pressure measurements on 8 deg cones
[AD-A075385] N80-19036
FREQUENCY ASSIGNMENT
Real-time adaptive HF frequency management N80-19376
FREQUENCY MODULATION
A standard for RF modulation factor
[PB80-109085] N80-19319
FREQUENCY SYNCHRONIZATION
Synchronization of the radio-4 (UK) transmitter chain on 200 kHz — examination of the means by which the carriers of three transmitters are phase locked
[BBC-RD-1979/27] N80-19317
FUEL CELLS
Coal processing fuel cell utilization. Task 8: H2S removal by calcium-based sorbents
[PSI-TR-167] N80-19300
Orbiter fuel cell performance constraints. STS/OPS Pratt Whitney fuel cells. Operating limits for mission planning
[NASA-TM-80958] N80-19610
Optimization of Pt-doped Kocite (trade name) electrodes in H3Po4 fuel cells
[AD-A079372] N80-19639
FUEL COMBUSTION
Fuel quality combustion analysis
[NASA-CR-162922] N80-19294
Centrifugal fluidized combustion of coal
[FE-2516-9] N80-19293
FUEL CONSUMPTION
Analysis of fuel-conservative curved decelerating approach trajectories for powered-lift and CTOL jet aircraft
[NASA-TP-1550] N80-19022
Issues concerning the light-duty diesel
[DOE/EV-0050/1] N80-19510
FUEL CONTROL
Demonstration program for a flexible duct valve for ramjet engine fuel controls
[AD-A078529] N80-19123
FUEL PRODUCTION
Pollutants from synthetic fuels production: Sampling and analysis methods for coal gasification
[PB80-104656] N80-19309
FUEL VALVES
Demonstration program for a flexible duct valve for ramjet engine fuel controls
[AD-A078529] N80-19123
FUNCTIONS (MATHEMATICS)
Special function solutions of the diffusion equation
[AD-A075324] N80-19899
Dispersion mapping theorems
[AD-A079704] N80-19907
FURLABLE ANTENNAS
Surface Accuracy Measurement Sensor for Deployable Reflector Antennas (SAMS DRA) N80-19152

G

GALACTIC RADIATION
A note on the revised galactic neutron spectrum of the Ames collaborative study
[NASA-CR-150554] N80-20002
GALLIUM ANTIMONIDES
Study of the electronic surface state of 3-5 compounds — physics and chemistry of indium phosphates, gallium arsenides, and gallium antimonides
[AD-A076304] N80-19969
GALLIUM ARSENIDES
Ion implanted GaAs integrated circuit process technology
[AD-A078958] N80-19438
VPE growth of (Al, Ga)As
[AD-A078264] N80-19957
Study of the electronic surface state of 3-5 compounds — physics and chemistry of indium phosphates, gallium arsenides, and gallium antimonides
[AD-A076304] N80-19969
GALLIUM COMPOUNDS
Highly conducting iodinated fluoroaluminum and fluorogallium phthalocyanine polymers
[AD-A078188] N80-19273
GAMMA RAY BEAMS
The 6-beam test, for gamma densitometer
[LTR-141-122] N80-19477
GARNETS
Magnetic moment versus temperature curves of rare-earth iron garnets
[AD-A077256] N80-19970
GAS ANALYSIS
Pollutants from synthetic fuels production: Sampling and analysis methods for coal gasification
[PB80-104656] N80-19309
GAS CHROMATOGRAPHY
A gas-sensitive semiconductor diractor for gas-chromatographic analysis
[BLL-RTS-11943] N80-19486
GAS DETECTORS
A gas-sensitive semiconductor diractor for gas-chromatographic analysis
[BLL-RTS-11943] N80-19486
GAS DISCHARGE TUBES
Plasma cathode thyratron
[AD-A079864] N80-19431
GAS DISCHARGES
Investigation of surface stabilized high-pressure gas discharges
[AD-A077040] N80-19483
GAS DYNAMICS
Gas channel formation: Dependence of hydrodynamic phenomena on the initial radial pressure profile
[AD-A078917] N80-19459
GAS EXCHANGE
Development of program for the control of the autotrophic component of an ecological system that is closed with regard to exchange of gases N80-19768
GAS HEATING
Gas channel formation: Dependence of hydrodynamic phenomena on the initial radial pressure profile
[AD-A078917] N80-19459
GAS MIXTURES
Lasing characteristics of gas mixtures involving UF6: Application to nuclear pumping of lasers
[NASA-CR-162618] N80-19480
GAS TUNGSTEN ARC WELDING
Investigation of weld pool structure and property control in pulsed arc welding
[AD-A078222] N80-19501
Hydrogen in HY-130 weld metal
[AD-A077574] N80-19508
GAS TURBINES
Novel ceramic turbine rotor concepts
[AD-A078869] N80-19118
Effect of engine operating environments on lubricant load carrying capacity of high gear load oils
[AD-A078421] N80-19278
Waste heat recovery unit design for gas turbine propulsion systems
[AD-A078154] N80-19503
GAS-METAL INTERACTIONS
Gas phase hydrogen permeation in alpha titanium and carbon steels
[NASA-CR-3190] N80-19236
Hydrogen effects on flow localization and fracture in type 304L stainless steel
[DP-MS-79-57] N80-19255
GAS-SOLID INTERACTIONS
Development of a fast fluid bed gasifier, task 2 and 3
[FE-2361-40] N80-19306
GASEOUS DIFFUSION
Gas phase hydrogen permeation in alpha titanium and carbon steels
[NASA-CR-3190] N80-19236
GASEOUS FISSION REACTORS
Argon/UF6 plasma experiments: UF6 regeneration and product analysis
[NASA-CR-3258] N80-19935
GASOHOL (FUEL)
Physical properties of gasoline/alcohol blends
[BERC/RI-79/4] N80-19296
GASOLINE
Physical properties of gasoline/alcohol blends
[BERC/RI-79/4] N80-19296
GEAR TEETH
Ideal spiral bevel gears: A new approach to surface geometry
[NASA-TM-81446] N80-19498
GEARS
Ideal spiral bevel gears: A new approach to surface geometry
[NASA-TM-81446] N80-19498

GELS
Glass shell manufacturing in space — residual gases in spherical shells made from metal-organic gels
[NASA-CR-161408] N80-19141

GENERAL AVIATION AIRCRAFT
Aeroacoustic wind-tunnel tests of a light twin-boom general-aviation airplane with free or shrouded-pusher propellers — in the Langley full-scale tunnel
[NASA-TM-80200] N80-19023
Rotary balance data for a typical single-engine general aviation design for an angle-of-attack range of 8 deg to 90 deg. 1: Low-wing model A — fluid flow and vortices data for general aviation aircraft to determine aerodynamic characteristics for various designs
[NASA-CR-3130] N80-19030
Estimation of the endurance of civil aircraft wing structures — life estimate method for wing loading on general aviation aircraft
[ESDU-79024] N80-19060
Assessment of risk due to the use of carbon fiber composites in commercial and general aviation N80-19201

GEODYNAMICS
Geodynamics international - 15
[PB80-111089] N80-19698

GEOLOGICAL SURVEYS
Brureau Known Geothermal Resource Area: An environmental analysis
[EGG-GTH-5004] N80-19602

GEOMAGNETISM
Investigation of magnetic field phenomena in the ionosphere
[AD-A075356] N80-19699

GEOMETRY
The geometry of the 37-tile microwave antenna support structure
[NASA-CR-162847] N80-19321
Linear time calculations of geometric properties using quadtrees
[AD-A078087] N80-19697
Constructions in geometry problem solving
[AD-A076338] N80-19804
Theory of constructions and set in problem solving
[AD-A076339] N80-19805

GEOPHYSICS
Magnetospheric research
[NASA-CR-161410] N80-19684
Geodynamics international - 15
[PB80-111089] N80-19698

GEORGIA
Solar energy system performance evaluation: A seasonal report for SEMCO, Macon, Georgia
[NASA-CR-161380] N80-19629

GEOTHERMAL RESOURCES
Brureau Known Geothermal Resource Area: An environmental analysis
[EGG-GTH-5004] N80-19602
Regional systems development for geothermal energy resources. Pacific region: California and Hawaii. Task 1: Implementation plan development — for the generation of electric power
[DOE/ET-28432-1] N80-19604
Regional systems development for geothermal energy resources. Pacific region: California and Hawaii. Task 2: Regional program monitoring and progress evaluation — for the generation of electric power
[DOE/ET-28432-2] N80-19605
Regional systems development for geothermal energy resources. Pacific region: California and Hawaii. Task 3: Water resources evaluation — for generation of electric power
[DOE/ET-28432-3/1] N80-19606
Regional systems development for geothermal energy resources. Pacific region: (California and Hawaii). Task 3: Water resources evaluation, appendices — for generation of electric power
[DOE/ET-28432-3/2] N80-19607

GERMANIUM
Investigation of higher order forbidden reflections in Si and Ge using synchrotron radiation N80-19963

GERMANIUM ALLOYS
GE-SI supersonic FLIR window
[AD-A078371] N80-19648

GERMANIUM COMPOUNDS
Photochemistry and radiation chemistry of volatile silanes and germanes
[COO-3418-13] N80-19229

GLACIERS
Multisensor analysis of hydrologic features in the Wind River Range, Wyoming with emphasis on the SEASAT SAR
[E80-10083] N80-19591

GLASS
Effect of number of chemical bonds on the strength of adhesion between glass and polybutadiene
[AD-A076237] N80-19274
Glass for low-cost photovoltaic solar arrays
[NASA-CR-162995] N80-19633
Why do glassy materials possess energy gaps
[AD-A079988] N80-19986

GLASS FIBER REINFORCED PLASTICS
Determination of the technical constants of laminates in oblique directions
[NASA-TM-75719] N80-19257

GLIDE PATHS
Multipath analysis of ILS glide path N80-19354

GOES SATELLITES
Satellite training course notes. Part 4: Cloud patterns and the upper air wing field
[AD-A077557] N80-19712
Analysis of NOAA-MSFC GOES X-ray telescope
[NASA-CR-161397] N80-19995

GOLD ALLOYS
Practical electroplating properties of electrochemically deposited metal and alloy coatings. Part 1: Gold and gold alloys
[BLL-TRS-11923] N80-19233

GOLD COATINGS
Practical electroplating properties of electrochemically deposited metal and alloy coatings. Part 1: Gold and gold alloys
[BLL-TRS-11923] N80-19233

GOVERNMENT PROCUREMENT
Evaluation of and recommended change to the Reliability Improvement Warranty (RIW) guidelines
[AD-A077672] N80-19519
Reliability improvement warranty: An overview N80-19527
Competition in the acquisition of major weapons systems
[AD-A078268] N80-19981

GOVERNMENT/INDUSTRY RELATIONS
Military adaption of a commercial VOR/ILS airborne radio with a reliability improvement warranty N80-19540

GRAPH THEORY
Local reconfiguration of networks of processors: Arrays, trees, and graphs
[AD-A077525] N80-19886

GRAPHITE
Effects of carbon/graphite fiber contamination on high voltage electrical insulation N80-19203
Quality control developments for graphite/PMR15 polyimide composites materials
[NASA-CR-159182] N80-19206
The oxidation of graphitic monolayers on Ni(110)
[AD-A079512] N80-19210
X-ray absorption studies of graphite intercalates and metal ammonia solutions
[LBL-9840] N80-19212

GRAPHITE-EPOXY COMPOSITE MATERIALS
Effects of proof-test on the strength and fatigue life of a unidirectional composite
[AD-A076234] N80-19211

GRAPHS (CHARTS)
Cellular D-graph automata with augmented memory
[AD-A077369] N80-19677

GRASSLANDS
A critical comparison of remote sensing and other methods for nondestructive estimation of standing crop biomass
[E80-10082] N85-19590

GRAVITATIONAL EFFECTS
Gravitational redshift space-probe experiment
[NASA-CR-161409] N80-19999

GRAVITATIONAL WAVES
Field resonance propulsion concept
[NASA-TM-80961] N80-19184

GROUND EFFECT (COMMUNICATIONS)
Loran-C pulse transient propagation. Part 1: Geophysical and geological data base evaluation for Loran-C ground wave propagation medium. Part 2: Loran-C ground wave secondary phase corrections over nonhomogeneous propagation techniques. Part 3: An experimental program to measure ECD and test the transient solution, with addendum
[AD-A077551] N80-19058

GROUND STATIONS
Standard engineering installation package. Air Traffic Radio Channel Control (ATRCC) equipment
[AD-A077648] N80-19059

GROUND SUPPORT SYSTEMS
Balloon systems and launch support
[AD-A075385] N80-19037
Sounding rocket and balloon systems support
[AD-A075384] N80-19038

GROUND WAVE PROPAGATION
Loran-C pulse transient propagation. Part 1: Geophysical and geological data base evaluation for Loran-C ground wave propagation medium. Part 2: Loran-C ground wave secondary phase corrections over nonhomogeneous propagation techniques. Part 3: An experimental program to measure ECD and test the transient solution, with addendum
[AD-A077551] N80-19058
Experimental measurements of ground reflection elevation multipath characteristics and its effects on a small aperture elevation tracking radar
[AD-A077915] N80-19027
Terrain profiles and contours in electromagnetic wave propagation
[AGARD-CP-269] N80-19045
The effects of stratified ground on characteristics of the inverted L antenna — current distributions, antenna radiation patterns, and impedance characteristics N80-19048
Surface fields and radiation patterns of a vertical electric dipole over a radially varying ground system N80-19048
Terrain effects on log-periodic antenna characteristics using the singularity expansion method N80-19349
Theories of ground wave propagation over mixed paths N80-19350
High-frequency signal propagation and scattering in guiding channels N80-19351
Ground wave propagation over irregular, inhomogeneous terrain: Comparisons of calculations and measurements at frequencies from 121 kHz to 50 mHz N80-19352
An experimental study of surface wave propagation on a low permittivity medium N80-19353
Theoretical distribution functions of multipath propagation and their parameters for mobile radio communication in quasi-smooth terrain N80-19358
On the influence of surface statistics, ground moisture content and wave polarization on the scattering of irregular terrain and on signal power spectra N80-19359
Ground-wave and sky-wave sea-state sensing experiments in the United Kingdom N80-19400
Excitation of the HF surface wave by vertical and horizontal apertures N80-19410

GROUND-AIR-GROUND COMMUNICATIONS
HF communication to small low flying aircraft N80-19374

GROUP DYNAMICS
Group decision making with feedback
[AD-A078159] N80-19980

GUAM
Scintillation of UHF Satcom signals, ocurrence at Guam from mid-March 1978 - June 1979
[AD-A078267] N80-19328

GYROSCOPES
Laser vibration gyroscope
[BLL-RTS-11579] N80-19467

H

H-17 HELICOPTER
Investigation of the airflow at rocket trajectory and wind sensor locations of a model helicopter simulating low speed flight. Application of model helicopter testing, laser velocity, and rotor wake flow visualization to investigate the aerodynamic interference at rocket trajectories and wind sensors of a helicopter operating in low speed flight
[AD-A075378] N80-19039

HABITUATION (LEARNING)
Effect of habituation on the susceptibility of the rat to restraint ulcers
[NASA-TM-76572] N80-19748

HADRONS
Nuclear phenomena and the short distance structure of hadrons
[SLAC-PUB-2395] N80-19933

HARDNESS
Research on nondestructive testing
[AD-A078483] N80-19517

HARMONIC OSCILLATION
Far field conditions for subsonic flows with small superimposed harmonic oscillations
[AD-A077693] N80-19043

HARPOON MISSILE
Harpoon pyrotechnic shock study
[AD-A078727] N80-19175

HARRIER AIRCRAFT
Microprocessor control of low speed V/STOL flight
[AD-A077661] N80-19129

HAWAII
Regional systems development for geothermal energy resources. Pacific region: California and Hawaii. Task 1: Implementation plan development — for the generation of electric power
[DOE/ET-28432-1] N80-19604
Regional systems development for geothermal energy resources. Pacific region: California and Hawaii. Task 2: Regional program monitoring and progress evaluation — for the generation of electric power
[DOE/ET-28432-2] N80-19605
Regional systems development for geothermal energy resources. Pacific region: California and Hawaii. Task 3: Water resources evaluation — for generation of electric power
[DOE/ET-28432-3/1] N80-19606
Regional systems development for geothermal energy resources. Pacific region: (California and Hawaii). Task 3: Water resources evaluation, appendices — for generation of electric power
[DOE/ET-28432-3/2] N80-19607

HAWK MISSILE
Helicopter pilot detection of the two different camouflaged hawk batteries
[AD-A077954] N80-19803

HAZARDS
Evaluation of equipment vulnerability and potential shock hazards — carbon fibers N80-19197
Effects of carbon fibers on consumer products N80-19204

HEAD-UP DISPLAYS
Comparison of specifications for Head-Up Displays in the Navy A-6M, A-7E, AV-8A, and F-14A aircraft
[AD-A080047] N80-19106
The A-7 head-up display reliability programme N80-19539
Reliability of high-brightness CRTs for airborne displays N80-19543

HEARING
Effects of artillery noise on the hearing of protected crew personnel
[AD-A078664] N80-19805

HEART RATE
Effect of hypokinesia on cardiac contractile function and nervous regulation of the heart
[NASA-TM-75970] N80-19783

HEAT CAPACITY MAPPING MISSION
Sea surface temperature of the coastal zones of France. Heat Capacity Mapping Mission (HCMM)
[E80-10057] N80-19585

HEAT EXCHANGERS
Data analysis for Ocean Thermal Energy Conversion (OTEC)
[AD-A077908] N80-19638

HEAT RESISTANT ALLOYS
Rejuvenation of turbine blade material by thermal treatment — of the heat resistant alloy blade material
[AD-A077527] N80-19121
Structure and properties of cast alloys
[AD-A077430] N80-19248
Alloy development of oxide dispersion strengthened high volume gamma nickel-base superalloys made by mechanical alloying
[AD-A077815] N80-19252

HEAT TRANSFER
The calculation of momentum and heat transfer in internal flows and in flows with small regions of separation
[AD-A078484] N80-19458
Tubing for augmented heat transfer
[GA-A-15442] N80-19462
A comparison of the results of several heat transfer computer codes when applied to a hypothetical nuclear waste repository
[ORNL/TM-7112] N80-19464
Experimental investigation into the heat flux in the piston and cylinder liner of a high-speed diesel engine
[BLL-RTS-11902] N80-19494
Special function solutions of the diffusion equation
[AD-A075324] N80-19899

HEAT TREATMENT
Rejuvenation of turbine blade material by thermal treatment — of the heat resistant alloy blade material
[AD-A077527] N80-19121
Stability to heat treatment of nickel-manganese deposits containing sulphur
[BLL-RTS-11591] N80-19254

HEATING
Theory of twisted nonuniformly heated bars
[NASA-TM-75758] N80-19565

HEATING EQUIPMENT
Tubing for augmented heat transfer
[GA-A-15442] N80-19462

HEAVY IONS
Cluster effects on charge state distributions for heavy ion molecular beams
[BNL-26785] N80-19930

HELICOPTER PERFORMANCE
Preliminary Airworthiness Evaluation UH-1H helicopter equipped with Multiple Target Electronic Warfare System (MULTEWS)
[AD-A078476] N80-19067

HELICOPTERS
A study of the canopy design for the advanced attack helicopter by use of computer graphics
[AD-A078291] N80-19060
NADC ABC rotor maps
[AD-A078802] N80-19083
Simulation of a night vision system for low level helicopter operations — using helmet mounted display device N80-19832

HELIUM ISOTOPES
Cooling liquid He-3 below 1 mK by nuclear demagnetization N80-19311

HELMETS
Lightweight pilot helmets: The issue of weight versus protection
[AD-A078325] N80-19806
Simulation of a night vision system for low level helicopter operations — using helmet mounted display device N80-19832

HEMODYNAMIC RESPONSES
Cardiovascular reaction to periodic head-pelvis accelerations on a short-arm centrifuge N80-19760

HEMODYNAMICS
Dynamics of erythrocyte count, hemoglobin, and catalase activity in rat blood in hypokinesia, muscular activity and restoration
[NASA-TM-76058] N80-19752

HIGH ENERGY INTERACTIONS
Testing quantum chromodynamics in electron-positron annihilation at high energies
[DOE/ER-01388-777] N80-19938

HIGH FREQUENCIES
Ground systems for HF antennas
[AD-A077691] N80-19339
Surface fields and radiation patterns of a vertical electric dipole over a radially varying ground system N80-19348
Special topics in HF propagation
[AGARD-CP-263] N80-19372
The role of HF in air-ground communications: An overview N80-19373
HF communication to small low flying aircraft N80-19374
Modern HF communications for low flying aircraft N80-19375
Real-time adaptive HF frequency management N80-19376
Assessment of HF communications reliability N80-19377
Comparison of measured and predicted MUF's at a remote location — high frequency radio transmitters N80-19378
Augmentation of HF propagation — using chemical ion clouds N80-19379
Tropospheric effects on HF Propagation N80-19380
The geomorphology of the HF breakthrough phenomenon N80-19385
Characteristics of the high latitude ionosphere produced by auroral particle precipitation N80-19389
Perspective on the prediction of auroral absorption N80-19390
Direction and Doppler characteristics of medium and long path HF signals within the night-time sub-auroral region N80-19391
Recent advances in HF propagation simulation N80-19392
HF wavefront irregularities observed on a large aperture receiving array N80-19396
Scatter injection/ducted mode HF radar N80-19398
Sea-state directional spectra observed by HF Doppler radar N80-19401
Development of HF skywave radar for remote sensing applications N80-19402
Principles of HF communication in tunnels using open transmission lines and leaky cables N80-19405
Excitation of the HF surface wave by vertical and horizontal apertures N80-19410
A mobile HF impulse source locator — thunderstorm location and tracking N80-19414
A new computer-controlled High Frequency direction-finding and transmitter locating system N80-19415
Digital on-line processing and display of multiparameter HF transmission data N80-19416
New technology to improve HF circuit reliability and availability for remote regions N80-19417
Electrically short HF aerial systems N80-19418

HIGH PASS FILTERS
An active filter primer
[AD-A078847] N80-19439

HIGH PRESSURE
Development of passive high pressure gauges: Field experiment
[AD-A077194] N80-19474
Investigation of surface stabilized high-pressure gas discharges
[AD-A077040] N80-19483

HIGH RESOLUTION
A high resolution soil moisture radiometer N80-19161

HIGH SPEED
Calculated and experimental data for a 118-mm bore roller bearing to 3 million DN
[NASA-TM-81427] N80-19496

HIGH TEMPERATURE
High temperature solar thermal receiver
[NASA-CR-162831] N80-19621

HIGH TEMPERATURE ENVIRONMENTS
High temperature penetrator assembly with bayonet plug and ramp-activated lock
[NASA-CASE-MSC-19526-1] N80-19488

HIGH TEMPERATURE PLASMAS
Confinement and heating of hot plasmas in a hybrid system of Tokamak and stellarator
[ISSN-0547-1567] N80-19953

HIGHWAYS
Remote sensing applications to resource problems in South Dakota — Chamberlain, Rapid City; Watertown; Spink County; Lake Herman and Six-Mile Creek Watersheds; and Missouri River waterfowl
[E80-10088] N80-19583

HMX
Deflagration-to-detonation transition in HMS based propellants
[AD-A078845] N80-19290

HOLES
An analysis of residual stresses and displacements due to radial expansion of fastener holes
[AD-A078370] N80-19589
HOLOGRAPHY
Synthetic aperture imaging techniques at short wavelengths
[AD-A078720] N80-19336
HOMEOSTASIS
Certain questions of the acclimatization of construction workers to the conditions of a subtropical climate
[NASA-TM-75726] N80-19797
HOMOGENEITY
Methods for analyzing the homogeneity of climatological series
[BLL-TRANS-1407-(6022.649)] N80-19701
HORIZON SCANNERS
Azimuth beamwidth effect on radar sensed terrain horizon profiles N80-19362
HORMONES
Effectiveness of using thyrocalcitonin for the prevention of a calcium metabolic disorder in the mineralized tissues of rabbits with 30 days hypokinesia
[NASA-TM-75987] N80-19751
HOVERING
Development of VTOL flying qualities criteria for low speed and hover
[AD-A079911] N80-19085
HUMAN FACTORS ENGINEERING
Spatial filtering and mechanisms of perception
[AD-A077622] N80-19788
Stress factors on pilot performance. A bibliography with abstracts
[PB80-803075] N80-19794
Human comfort response to random motions with combined yawing and rolling motions
[NASA-CR-159187] N80-19802
Representing human thought and response in military conflict simulation models N80-19813
HUMAN PERFORMANCE
Helicopter pilot detection of the two different camouflaged hawk batteries
[AD-A077954] N80-19803
HURRICANES
HF skywave radar estimates of the track, surface wind and waves of hurricane Anita N80-19403
HYBRID CIRCUITS
Program to design, develope, fabricate and deliver thin film chip inductors suitable for hybrid circuit applications
[AD-A078940] N80-19432
Research in remote signal transmission electronics
[ORNL/SUB-7644/10] N80-19444
HYBRID NAVIGATION SYSTEMS
New possibilities offered by a radio-inertial hybrid guidance system digital simulation study N80-19836
HYDRAULIC EQUIPMENT
An analytical and experimental study of aircraft hydraulic lines including the effect of mean flow
[AD-A079746] N80-19079
HYDRAZINES
Evaporation and dispersion of hazardous materials
[AD-A077389] N80-19291
HYDROCARBON FUEL PRODUCTION
Environmental assessment of the HYGAS process. Volume 1: HYGAS environmental characterization, data synthesis, analysis, and interpretation, tests 37 - 64
[FE-2433-25-VOL-1] N80-19005
HYDROCARBON FUELS
Advanced oxygen-hydrocarbon rocket engine study
[NASA-CR-161390] N80-19186
HYDRODYNAMIC EQUATIONS
Gas channel formation: Dependence of hydrodynamic phenomena on the initial radial pressure profile
[AD-A078017] N80-19459
HYDROELASTICITY
Hydroelastic vibration analysis of partially liquid-filled shells using a series representation of the liquid
[NASA-TP-1558] N80-19563
HYDROELECTRIC POWER STATIONS
Cataract hydroelectric development expansion study
[DOE/ID-01796-1] N80-19650
Potential hydroelectric power, vertical turbine, spillway combine Broadwater Dam
[DOE/ID-01822-1] N80-19651
HYDROFLUORIC ACID
The corrosion of silicate materials by hydrogen gas and hydrofluoric acid solution
[LBL-8887] N80-19214
HYDROGEN
The corrosion of silicate materials by hydrogen gas and hydrofluoric acid solution
[LBL-8887] N80-19214
Gas phase hydrogen permeation in alpha titanium and carbon steels
[NASA-CR-3180] N80-19236
Hydrogen in HY-130 weld metal
[AD-A077574] N80-19508
Electrolysis-based hydrogen storage systems overview and rationale of the Brookhaven National Laboratory managed program
[BNL-26904] N80-19654
Mobile source NOx monitor, hydrogen-atom direct chemiluminescence method
[PB80-102758] N80-19670
HYDROGEN EMBRITTLEMENT
Hydrogen entry and transport mechanisms in structural metals
[AD-A078612] N80-19248
Hydrogen effects on flow localization and fracture in type 304L stainless steel
[DP-MS-79-57] N80-19255
HYDROGEN OXYGEN FUEL CELLS
Advanced technology light weight fuel cell program — orbiting space vehicle long-life hydrogen oxygen fuel cell
[NASA-CR-159807] N80-19615
HYDROGEN PRODUCTION
Hydrogen and methane syntheses through radiation catalysis N80-19297
Thermochemical processes for hydrogen production
[LA-7937-PR] N80-19299
HYDROGEN SULFIDE
The chemistry of sulfur in char and the implications for hydrogasification/hydrodesulfurization
[PE-2449-9] N80-19298
HYDROGEOLOGY
Remote sensing applications to resource problems in South Dakota — Chamberlain, Rapid City, Watertown; Spink County; Lake Herman and Six-Mile Creek Watersheds; and Missouri River waterfowl
[E80-10086] N80-19593
HYDROGRAPHY
Application of Loran-C positioning to hydrographic surveying
[AD-A078278] N80-19057
Representation of hydrographic surveys and ocean bottom topography by analytical models
[AD-A078282] N80-19746
The evaluation of dual beam echo sounders in hydrographic surveying
[AD-A078273] N80-19747
HYDROLOGY
Multisensor analysis of hydrologic features in the Wind River Range, Wyoming with emphasis on the SEASAT SAR
[E80-10083] N80-19591
HYDROXIDES
Prospects for broadening the range of inorganic binding agents
[RTS-11804] N80-19218
HYPERBOLIC DIFFERENTIAL EQUATIONS
Finite element method for the tricomi problem
[ORO-3443-84] N80-19911
HYPERCAPNIA
Effect of hypoxia and hypercapnia on lactate and pyruvate levels in rat blood and myocardium N80-19775
HYPERFINE STRUCTURE
Plans for laser hyperfine structure measurement at UNISOR
[CONF-790975-1] N80-19488
HYPEROXIA
Effect of hyperoxia on oxygen transport properties of blood N80-19763
HYPERSONIC FLIGHT
Trajectories optimization in hypersonic flight
[NASA-CR-162946] N80-19026
Hypersonic interference flow flight experiment design — investigating aerodynamic heating and loads
[AD-A079881] N80-19044
HYPERSONIC NOZZLES
Laser-Raman flow-field diagnostics of two large hypersonic test facilities
[AD-A078289] N80-19135
HYPODYNAMIA
Metabolism during hypodynamia
[NASA-TM-75996] N80-19785
HYPOKINESIA
Effect of graded physical load on the state of the liver from morphometric data and biochemical blood indices of rats against a background of hypokinesia
[NASA-TM-75969] N80-19750
Effectiveness of using thyrocalcitonin for the prevention of a calcium metabolic disorder in the mineralized tissues of rabbits with 30 days hypokinesia
[NASA-TM-75987] N80-19751
Dynamics of erythrocyte count, hemoglobin, and catalase activity in rat blood in hypokinesia, muscular activity and restoration
[NASA-TM-76058] N80-19752
State of the mineral component of rat bone tissue during hypokinesia and the recovery period
[NASA-TM-76059] N80-19753
External respiration and acid-base balance of human blood during long-term antiorthostatic hypokinesia and in the recovery period N80-19784
Distinctions in development of pyrogenal fever in animals following prolonged hypokinesia N80-19785
Dynamics of stress reaction of rats during experimental hypokinesia varying in duration, and possibility of correction thereof N80-19771
Effect of brief antiorthostatic hypokinesia on blood immunoglobulin content N80-19772
Effect of hypokinesia on cardiac contractile function and nervous regulation of the heart
[NASA-TM-75970] N80-19783
Alimentary hypokinesia
[NASA-TM-75989] N80-19784
HYPOXIA
Effect of hypoxia and hypercapnia on lactate and pyruvate levels in rat blood and myocardium N80-19775
HYSTERESIS
Wind tunnel test to investigate aerodynamic hysteresis phenomena of the F-4 and F-11 aircraft models
[AD-A077196] N80-19040

I

ICE
Ice seal for rotating shafts
[AD-A076308] N80-19506
ICE FORMATION
Aircraft icing during low-level flights
[AD-A078843] N80-19052
ICE MAPPING
SMMR simulator radiative transfer calibration model. 1: Derivation
[E80-10091] N80-19589
Statistical analysis of terrain and water (ice) backgrounds in a winter scene from northern Michigan
[AD-A077554] N80-19598
ICE NUCLEI
Cirrus particle distribution study, part 5
[AD-A077361] N80-19741
ICE REPORTING
Climatic chamber tests of a surface ice accretion measurement system
[AD-A077022] N80-19725
IDAHO
Bruneau Known Geothermal Resource Area: An environmental analysis
[EGG-GTH-5004] N80-19602
IFF SYSTEMS (IDENTIFICATION)
Use of simulation in the evaluation of the IFFN process N80-19833
ILLIAC 4 COMPUTER
Texture extraction on the ILLIAC 4 — aerial images
[AD-A070523] N80-19471

ILLUMINATING
Crew station design facility feasibility study
[AD-A078134] N80-19054
IMAGE ENHANCEMENT
Video processing of remote sensor data applied to uranium exploration in Wyoming
[GJBX-171(79)] N80-19603
IMAGE INTENSIFIERS
Some properties of discontinuities in the image irradiance equation
[AD-A078062] N80-19946
IMAGE PROCESSING
An application of the photometric stereo method
[AD-A078125] N80-19470
Texture extraction on the ILLIAC 4 — aerial images
[AD-A070523] N80-19471
As-built design specifications of the LANDSAT Imagery Verification and Extraction System (LIVES). Volume 1: Text and appendices
[E80-10077] N80-19586
Comparative study of anomalous gray-shade patterns in DMSP and LANDSAT imagery
[AD-A077902] N80-19595
Landsat MSS coordinate transformations — determining satellite orbits
[AD-A078418] N80-19596
Tri-bar reading correction for oblique imagery
[AD-A078340] N80-19600
Interactive digital image processing investigation
[AD-A078342] N80-19601
Video processing of remote sensor data applied to uranium exploration in Wyoming
[GJBX-171(79)] N80-19603
Analyze, calculate, and develop techniques for weather satellite imagery data
[AD-A077292] N80-19735
Interframe adaptive data compression techniques for images
[AD-A078841] N80-19873
Region representation: Quadtrees from boundary codes
[AD-A078350] N80-19892
Linear time calculations of geometric properties using quadtrees
[AD-A078087] N80-19897
Differential geometry, surface patches and convergence methods
[AD-A078061] N80-19927
DEFT: Advanced structures and applications
[AD-A075373] N80-19947
Application of digital image processing techniques to astronomical imagery, 1979
[NASA-CR-162877] N80-19996
Opportunities and problems in introducing or expanding the teaching of remote sensing in universities N80-20011
Textbooks and technical references for remote sensing N80-20014
Data reduction by computer processing N80-20016
The reduction of remote sensing data by visual means — education N80-20017
IMAGE RESOLUTION
Multisensor analysis of hydrologic features in the Wind River Range, Wyoming with emphasis on the SEASAT SAR
[E80-10083] N80-19591
Tri-bar reading correction for oblique imagery
[AD-A078340] N80-19600
IMAGES
Some properties of discontinuities in the image irradiance equation
[AD-A078062] N80-19946
IMAGING TECHNIQUES
Synthetic aperture imaging techniques at short wavelengths
[AD-A078720] N80-19336
Color ink-jet demonstration program
[AD-A075377] N80-19476
Acoustic microscopy for nondestructive evaluation of materials
[AD-A078088] N80-19516
Interframe adaptive data compression techniques for images
[AD-A078841] N80-19873
Analytical studies of phase estimation techniques, volume 1
[AD-A078006] N80-19944
Application of digital image processing techniques to astronomical imagery, 1979
[NASA-CR-162877] N80-19996
IMMOBILIZATION
Effect of habituation on the susceptibility of the rat to restraint ulcers
[NASA-TM-78072] N80-19748
Reaction of chickens to graduated length of exposure to stress
[NASA-TM-78071] N80-19754
IMPACT RESISTANCE
Improved impact fracture resistance in oxidation-toughened Si3n4-20 vol% ZrO2
[AD-A078833] N80-19341
IMPEDANCE
The effects of stratified ground on characteristics of the inverted L antenna — current distributions, antenna radiation patterns, and impedance characteristics N80-19346
Surface fields and radiation patterns of a vertical electric dipole over a radially varying ground system N80-19348
Terrain effects on log-periodic antenna characteristics using the singularity expansion method N80-19349
IN-FLIGHT MONITORING
Aspects of flight test instrumentation — methods to derive aircraft performance and stability and control characteristics N80-19098
INCOMPRESSIBLE FLUIDS
Damping in tapered annular seals for an incompressible fluid
[NASA-TP-1646] N80-19495
INDEXES (DOCUMENTATION)
Guide to standard weather summaries and climatic services
[AD-A078680] N80-19708
INDICATING INSTRUMENTS
Leaky coaxial cables for obstacle detection and continuous access guided communications N80-19407
INDIUM ANTIMONIDES
Crystal growth and phase stability of metastable indium antimonide bismide thin films N80-19985
INDIUM PHOSPHATES
Study of the electronic surface state of 3-5 compounds — physics and chemistry of indium phosphates, gallium arsenides, and gallium antimonides
[AD-A076304] N80-19969
INDOLES
Kinetics and mechanism of desulfurization and denitrogenation of coal-derived liquids — quinoline, indole, dibenzothiophene, and naphthalene
[FE-2028-15] N80-19292
INDUCTANCE
Detection of a normal zone in inductively coupled superconducting coils
[UCRL-83307] N80-19446
INDUCTORS
Program to design, develope, fabricate and deliver thin film chip inductors suitable for hybrid circuit applications
[AD-A078840] N80-19432
INDUSTRIAL ENERGY
Characterization and assessment of selected solar thermal energy systems for residential and process heat applications
[LA-7995-TASE] N80-19648
INDUSTRIAL PLANTS
Evaluation of operation and maintenance factors limiting biological wastewater treatment plant performance
[PB80-105947] N80-19993
INDUSTRIAL WASTES
Use of remote sensing for land use policy formulation — Kalamazoo, Lake, Mecosta, Newaygo, Osceola, and Wexford counties, Michigan
[E80-10085] N80-19592
Engineering evaluation of control technology for H-Coal and Exxon donor solvent processes
[PB80-108566] N80-19678
INELASTIC SCATTERING
The elastic and inelastic scattering of 0.8 GeV protons by Y-89 and Zr-90 N80-19934
INERTIAL FUSION (REACTOR)
Consequences of intensity constraints on inertial confinement fusion
[UCRL-83342] N80-19961
INERTIAL GUIDANCE
New possibilities offered by a radio-inertial hybrid guidance system digital simulation study N80-19836
INERTIAL NAVIGATION
Cruise-missile-carrier navigation requirements N80-19843
INERTIAL UPPER STAGE
Failure analysis and resin evaluation if IUS SRM-1 92 inch prototype motor case
[AD-A077407] N80-19189
INFERENCE
On the problems of construction and statistical inference associated with a generalization of canonical variables N80-19895
INFESTATION
Use of remote sensing for land use policy formulation — Kalamazoo, Lake, Mecosta, Newaygo, Osceola, and Wexford counties, Michigan
[E80-10085] N80-19592
INFLATING
Recovery system preliminary design. A simplified approach to determining staging, timing and altitude requirements for fast inflating parachutes
[AD-A077548] N80-19041
INFORMATION MANAGEMENT
The levels of edit, second edition
[NASA-CR-162980] N80-19983
INFORMATION RETRIEVAL
Random access memories. Citations from the NTIS data base
[PB80-802333] N80-19858
Random access memories, volume 1. Citations from the Engineering Index data base
[PB80-802341] N80-19859
On optimization of query processing strategies
[AD-A078470] N80-19986
INFORMATION SYSTEMS
Objectives for building an experimental CCIS N80-19815
On the use of simulation in the design and implementation of distributed systems
[AD-A078322] N80-19853
The space science data service: A study of its efficiencies and costs
[NASA-TM-80760] N80-19982
Programming support library. Volume 1: Functional requirements
[AD-A078438] N80-19985
INFORMATION THEORY
Region representation: Quadtrees from boundary codes
[AD-A078350] N80-19892
INFRARED ABSORPTION
Atmospheric water vapor absorption at 12 CO2 laser frequencies
[NASA-CR-162850] N80-19083
INFRARED IMAGERY
Statistical analysis of terrain and water (ice) backgrounds in a winter scene from northern Michigan
[AD-A077554] N80-19598
Statistical analysis of terrain and water backgrounds in the vicinity of Port Hueneme, California
[AD-A077025] N80-19599
INFRARED LASERS
Submillimeter wave spectroscopy and technology — optically-pumped laser spectroscopy
[AD-A078003] N80-19222
INFRARED RADIATION
Advanced infrared signature prediction program. Spectral calculation of radiation from a turbine propulsion system as intercepted by an observer (SCORPION). Volume 3: Analysis
[AD-A078436] N80-19124
INFRARED SPECTROSCOPY
Fourier Transform Infrared Spectroscopy (FTIS). Volume 1: Technical Report — service life of solid rocket propellants
[AD-A079996] N80-19227
Fourier Transform Infrared Spectroscopy (FTIS). Volume 2: User's manual
[AD-A079997] N80-19228
Comparison of crystallinity and molecular orientation between surface and bulk of some polymers by FTIR-ATR and transmission spectroscopy — polyethylene and polypropylene
[AD-A078243] N80-19269

INFRARED TRACKING
Intelligent tracking techniques — for FLIR and TV imagery
[AD-A077989] N80-19043
INFRARED WINDOWS
GE-SI supersonic FLIR window
[AD-A078371] N80-19048
INJECTION LASERS
Injection laser waveguide coupler
[AD-A077939] N80-19484
INORGANIC COMPOUNDS
Prospects for broadening the range of inorganic binding agents
[RTS-11804] N80-19218
Ways to inorganic polymers
[BLL-RTS-11805] N80-19262
INSTALLING
Installation and checkout of the DOE/NASA Mod-1 2000-kW wind turbine generator
[NASA-TM-81444] N80-19614
INSTRUMENT ERRORS
Errors in the measurement of angle with a laser interferometer
[AD-A078048] N80-19481
INSTRUMENT LANDING SYSTEMS
A standard for RF modulation factor
[PB80-109085] N80-19319
Multipath analysis of ILS glide path N80-19054
INTEGERS
A bounding technique for integer linear programming with binary variables
[AD-A075575] N80-19882
INTEGRATED CIRCUITS
Monte Carlo simulation for integrated circuits
[BLL-RTS-11885] N80-19421
Microcracks and metallization burnout
[AD-A078019] N80-19430
Ion implanted GaAs integrated circuit process technology
[AD-A078958] N80-19438
Reliability assurance for large scale integrated circuits N80-19542
Military Adaptation of Commercial Item (MACI) program on Electrically Alterable Read Only Memory (EAROM) — metal-nitride-oxide semiconductors
[AD-A078594] N80-19851
Advanced electronic technology
[AD-A077589] N80-20021
INTEGRATED ENERGY SYSTEMS
Screening evaluation of electric power cycles integrated with coal gasification plants
[EPRI-AF-1169] N80-19646
INTEGRATED OPTICS
Integrated optics for rf spectrum analysis and acoustic microscopy for the study of material joints N80-19940
INTERFEROMETERS
Errors in the measurement of angle with a laser interferometer
[AD-A078048] N80-19481
Use of laser interferometer for position feedback
[Y-2188] N80-19489
Background Optical Suppression System (BOSS)
[AD-A077871] N80-19945
INTERFEROMETRY
Errors in the measurement of angle with a laser interferometer
[AD-A078048] N80-19481
INTERMETALLICS
Moessbauer effect investigations of the electronic and magnetic properties of rare earth metals and intermetallic hydrides
[CONF-790739-4] N80-19973
INTERPLANETARY MAGNETIC FIELDS
Interplanetary medium data book, supplement, 1975 - 1978
[NASA-TM-80759] N80-19997
INTERPLANETARY MEDIUM
Interplanetary medium data book, supplement, 1975 - 1978
[NASA-TM-80759] N80-19997
INTERPOLATION
Fast algorithms for solving Toeplitz system of equations and finding Rational Hermite Interpolants
[AD-A075376] N80-19901
INVARIANT IMBEDDINGS
Generalizations of compactness and cardinal invariants of spaces N80-19925
INVISCID FLOW
Application of a numerically generated orthogonal coordinate system to the solution of inviscid axisymmetric supersonic flow over blunt bodies
[NASA-TP-1819] N80-19031
Steady-wave analysis of the effect of porosity on viscous and inviscid detonations by use of a reactive-porous analog
[LA-7819] N80-19483
IODINE
Highly conducting iodinated fluoroaluminum and fluorogallium phthalocyanine polymers
[AD-A078168] N80-19273
IODINE LASERS
Lasing characteristics of gas mixtures involving UF6: Application to nuclear pumping of lasers
[NASA-CR-162818] N80-19480
Chemically pumped iodine laser — based on the chemical production of oxygen
[AD-A078918] N80-19485
ION BEAMS
Cluster effects on charge state distributions for heavy ion molecular beams
[BNL-26765] N80-19930
ION CHARGE
Cluster effects on charge state distributions for heavy ion molecular beams
[BNL-26765] N80-19930
ION DENSITY (CONCENTRATION)
Interplanetary medium data book, supplement, 1975 - 1978
[NASA-TM-80759] N80-19997
ION IMPLANTATION
Ion implanted GaAs integrated circuit process technology
[AD-A078958] N80-19438
ION SCATTERING
Characterization of tungsten dispenser cathodes using ISS and SIMS
[AD-A077592] N80-19428
Characterization of LPE grown HgCdTe by ion scattering spectrometry
[AD-A077884] N80-19968
IONIZATION
Evaluation of classical vaporization and ionization interferences in a miniature ICP
[AD-A077886] N80-19225
IONIZATION CROSS SECTIONS
Augmentation of HF propagation — using chemical ion clouds N80-19379
Dissociative and double photoionization of CO2 from threshold to 90 A
[NASA-CR-162844] N80-19929
IONIZERS
Normal ionizing shock as a theta pinch preionizer
[LA-8064-MS] N80-19960
IONOGRAMS
Methods of determining ionospheric structure from oblique sounding data N80-19384
IONOSONDES
Toward global monitoring of the ionosphere in real time by a bottomside network: The geophysical requirements and the technological opportunity N80-19381
Digital on-line processing and display of multiparameter HF transmission data N80-19416
IONOSPHERE
Detection, ranging and diffspeed measurements of equatorial ionospheric irregularities by means of airglow observations N80-19395
Ionospheric-Magnetospheric Plasma Experiment (IMPE)
[AD-A078082] N80-19687
Investigation of magnetic field phenomena in the ionosphere
[AD-A075356] N80-19689
DMSP auroral images and the Goose Bay ionosphere
[AD-A077023] N80-19691
Magnetosheath effects on cylindrical Langmuir probes
[NASA-CR-162852] N80-19958
IONOSPHERIC DISTURBANCES
Coupling between the neutral and ionized upper atmosphere during disturbed conditions N80-19386
Ionospheric effects of a solar eclipse in the Cape Verde Islands N80-19399
IONOSPHERIC ELECTRON DENSITY
Methods of determining ionospheric structure from oblique sounding data N80-19384
IONOSPHERIC PROPAGATION
Scintillation of UHF Satcom signals, ocurrence at Guam from mid-March 1978 - June 1979
[AD-A078267] N80-19328
A computer program for ELF/VLF pulse propagation in a laterally homogeneous Earth-ionosphere waveguide
[AD-A078306] N80-19341
Special topics in HF propagation
[AGARD-CP-263] N80-19372
Modern HF communications for low flying aircraft N80-19375
Assessment of HF communications reliability N80-19377
Augmentation of HF propagation — using chemical ion clouds N80-19379
The influence of ionospheric models on calculations of decametric wave propagation N80-19383
The geomorphology of the HF breakthrough phenomenon N80-19385
Basic findings helpful for ionospheric predictions — lunar tides in the F region N80-19387
On determining the Maximum Usable Frequency (MUF) N80-19388
Characteristics of the high latitude ionosphere produced by auroral particle precipitation N80-19389
Recent advances in HF propagation simulation N80-19392
A sporadic E prediction technique N80-19397
IONOSPHERIC SOUNDING
Toward global monitoring of the ionosphere in real time by a bottomside network: The geophysical requirements and the technological opportunity N80-19381
Methods of determining ionospheric structure from oblique sounding data N80-19384
Coupling between the neutral and ionized upper atmosphere during disturbed conditions N80-19386
IONS
Picosecond laser studies of aromatic radical ions
[AD-A078721] N80-19219
IRON
Hydrogen entry and transport mechanisms in structural metals
[AD-A078812] N80-19248
Development of a Fe-Pb(Ti) secondary battery system N80-19606
Magnetic moment versus temperature curves of rare-earth iron garnets
[AD-A077356] N80-19970
IRON OXIDES
Solid state, surface and catalytic properties of oxides
[COO-4067-1] N80-19974
IRRADIANCE
Some properties of discontinuities in the image irradiance equation
[AD-A078062] N80-19946
IRRADIATION
The effect of nickel and nitrogen on void formation in vanadium N80-19232
Hydrogen and methane syntheses through radiation catalysis N80-19297
IRREGULARITIES
Transequatorial propagation through equatorial plasma bubbles: Discrete events N80-19393
The phenomenology of transequatorial radio propagation under spread-F conditions N80-19394
Detection, ranging and diffspeed measurements of equatorial ionospheric irregularities by means of airglow observations N80-19395
Model computations of radio wave scintillation caused by equatorial bubbles
[AD-A077028] N80-19690
IRRIGATION
Solar powered liquid piston Stirling cycle irrigation pump
[SAN/1884-1] N80-19641
ISLANDS
Ionospheric effects of a solar eclipse in the Cape Verde Islands N80-19399
ISOSTATIC PRESSURE
Modeling of the hot isostatic pressing process — for metal forming techniques with metal powder
[AD-A078162] N80-19502
ITERATION
Analytic and numerical investigation of the convergence for the adaptive-wall concept
[AD-A078203] N80-19134

J

J-79 ENGINE
Evaluation of fuel character effects on J79 engine combustion system
[AD-A078440] N80-19119

J-85 ENGINE
Tests of an improved rotating stall control system on a J-85 turbojet engine
[AD-A077704] N80-19109

JET AIRCRAFT
Wind tunnel test to investigate aerodynamic hysteresis phenomena of the F-4 and F-11 aircraft models
[AD-A077196] N80-19040
Measuring technological change in jet fighter aircraft
[AD-A077393] N80-19084

JET ENGINES
Structural analysis of hollow blades: Torsional stress analysis of hollow fan blades for aircraft jet engines
[NASA-TM-75718] N80-19111
Ferrographic and spectrographic analysis of oil sampled before and after failure of a jet engine
[NASA-TM-81430] N80-19497

JET FLOW
Visualization of unsteady jets and aerodynamic noise fields
[CUED/A-TURBO/TR-96] N80-19029
An analysis of turbulent diffusion flame in axisymmetric jet
[NASA-CR-162984] N80-19449
Vorticity associated with multiple jets in a crossflow — vertical takeoff aircraft
[NASA-CR-162955] N80-19454
On the feedback phenomenon of an impinging jet
[AD-A078952] N80-19480

JOINTS (JUNCTIONS)
Integrated optics for rf spectrum analysis and acoustic microscopy for the study of material joints
N80-19940

JOSEPHSON JUNCTIONS
Josephson junctions. Citations from the NTIS data base
[PB80-802655] N80-19975
Josephson junctions, volume 2. Citations from the Engineering Index data base
[PB80-802663] N80-19976

JUMPERS
Figure-of-merit for bare and coated wires and flat ribbon jumpers
[BDX-613-2304] N80-19445

K

KIDNEYS
Kidney cell electrophoresis
[NASA-CR-160555] N80-19782

L

LABRADOR
DMSP auroral images and the Goose Bay ionosphere
[AD-A077023] N80-19691

LACTATES
Effect of hypoxia and hypercapnia on lactate and pyruvate levels in rat blood and myocardium
N80-19775

LAKES
Multisensor analysis of hydrologic features in the Wind River Range, Wyoming with emphasis on the SEASAT SAR
[E80-10083] N80-19591
Remote sensing applications to resource problems in South Dakota — Chamberlain, Rapid City; Watertown; Spink County; Lake Herman and Six-Mile Creek Watersheds; and Missouri River waterfowl
[E80-10086] N80-19593

LAMINAR BOUNDARY LAYER
A theoretical analysis of simulated transonic boundary layers in cryogenic-nitrogen wind tunnels
[NASA-TP-1631] N80-19131
An evaluation of the two-parameter momentum-integral laminar boundary layer calculation method of head
[AD-A077325] N80-19456

LAMINATES
Determination of the technical constants of laminates in oblique directions
[NASA-TM-75719] N80-19207
TI-59 magnetic card calculator solutions to composite materials formulas
[AD-A078043] N80-19208

LANCE MISSILE
The 12821A Lance, Missile Number 4819, Round Number 335 NCL, 13 August 1979
[AD-A079995] N80-19732

LAND MANAGEMENT
Prototype overland flow test data: June 1977 - May 1978
[AD-A078743] N80-19587

LAND USE
Use of remote sensing for land use policy formulation — Kalamazoo, Lake, Mecosta, Newaygo, Osceola, and Wexford counties, Michigan
[E80-10085] N80-19592
Remote sensing applications to resource problems in South Dakota — Chamberlain, Rapid City; Watertown; Spink County; Lake Herman and Six-Mile Creek Watersheds; and Missouri River waterfowl
[E80-10086] N80-19593

LANDING SIMULATION
A flight simulation investigation on the feasibility of curved approaches under MLS guidance
N80-19644
Modeling and flight simulation of an active configured aircraft under M.L.S. guidance N80-19945

LANGUAGES
Structures in aeronautical phraseology: From English to Spanish N80-19978

LARGE SCALE INTEGRATION
Computer aided evolutionary design for digital integrated systems
[AD-A078124] N80-19865

LARGE SPACE STRUCTURES
Development of a composite geodetic structure for space construction, phase 1A
[NASA-CR-160558] N80-19144
Large Space Systems Technology, 1979 — antenna and space platform systems conference
[NASA-CP-2116] N80-19145
Offset weap rib concept and development
N80-19146
Advanced sunflower antenna concept development — stowable reflectors N80-19147
Construction alignment sensor feasibility demonstrations (laser measurement) N80-19148
JPL self pulsed laser surface measurement system development — large space deployed antenna structures N80-19149
FY-79 - LSST antenna technology development
N80-19150
Development of the Maypole (Hoop/Column) deployable reflector concept for large space systems applications N80-19151
Structural assembly in space N80-19159
Space construction and utility distribution
N80-19160
Large space system control technology overview
N80-19162
Large space system control technology status and accomplishments N80-19163
Large space system control technology model order reduction study N80-19164
LaRC controls activity for LSST N80-19165
FY-79 - development of fiber optics connector technology for large space systems N80-19170
Flexible materials technology N80-19171
Advanced materials for space N80-19172

LASER ANEMOMETERS
Experimental pulsed laser remote crosswind measurement system. Feasibility study and design, part 5
[AD-A077631] N80-19721

LASER APPLICATIONS
Construction alignment sensor feasibility demonstrations (laser measurement) N80-19148
Surface measuring technique — using a laser to scan the surface of a reflector N80-19155
Picosecond laser studies of aromatic radical ions
[AD-A078721] N80-19219
Optical-communication systems for deep-space applications
[NASA-CR-162882] N80-19323
Synthetic aperture imaging techniques at short wavelengths
[AD-A078720] N80-19336
Errors in the measurement of angle with a laser interferometer
[AD-A078048] N80-19481
Development of the neodymium pentaphosphate (NPP) laser
[AD-A078603] N80-19486
Plans for laser hyperfine structure measurement at UNISOR
[CONF-790976-1] N80-19488
Use of laser interferometer for position feedback
[Y-2198] N80-19489
Carbon monoxide lasers. Citations from the NTIS data base — bibliographies
[PB80-803133] N80-19490
Carbon monoxide lasers, volume 2. Citations from the Engineering Index data base — bibliographies
[PB80-803141] N80-19491
A biological waste water monitor study using differential laser light scattering from bacteria
[AD-A078527] N80-19985

LASER DOPPLER VELOCIMETERS
Development of a laser-Doppler velocimeter for use in the aquatic environment N80-19479

LASER FUSION
Consequences of intensity constraints on inertial confinement fusion
[UCRL-83342] N80-19961

LASER MATERIALS
Development of the neodymium pentaphosphate (NPP) laser
[AD-A078603] N80-19486

LASER PLASMA INTERACTIONS
Consequences of intensity constraints on inertial confinement fusion
[UCRL-83342] N80-19961

LASER PLASMAS
A theory of anomalous absorption, backscatter and flux limitation in laser produced plasmas
[AD-A075390] N80-19956

LASER PUMPING
Chemically pumped iodine laser — based on the chemical production of oxygen
[AD-A078919] N80-19485

LASER RANGE FINDERS
JPL self pulsed laser surface measurement system development — large space deployed antenna structures N80-19149
A laser profilometer for digital terrain mapping
N80-19389

LASER SPECTROSCOPY
Submillimeter wave spectroscopy and technology — optically-pumped laser spectroscopy
[AD-A078003] N80-19222

LASING
Lasing characteristics of gas mixtures involving UFG: Application to nuclear pumping of lasers
[NASA-CR-162818] N80-19480

LATERAL STABILITY
Digital computer solution of aircraft longitudinal and lateral directional dynamic characteristics
[AD-A078672] N80-19068

LATEX
Experimental studies of multiple-scattered light from latex spheres — in rocket exhaust
[AD-A078322] N80-19191

LAUNCH ESCAPE SYSTEMS
Prototype development passive, seat-mounted limb retention system
[AD-A078331] N80-19053

LAUNCHING
New remotely piloted vehicle launch and recovery concepts. Volume 1: Analysis, preliminary design and performance/cost trade studies
[AD-A077475] N80-19066

LEAD OXIDES
Mechanistic studies of the effect of lead salts on double base propellant combustion. The use of model systems — effects of lead oxides on pyrolysis of propyl nitrates
[AD-A075371] N80-19286

LEAD TITANATES
Development of a Fe-Pb(Ti) secondary battery system N80-19608

LEADING EDGES
Aerodynamic investigation of C-141 leading edge modification for cruise drag reduction, volume 2
[AD-A077686] N80-19081

LEAR JET AIRCRAFT
Atmospheric electricity and military operations
[AD-A079482] N80-19683
LEARNING
Biofeedback. A bibliography with abstracts
[PB80-803117] N80-19790
Theory of constructions and set in problem solving
[AD-A079339] N80-19905
LEARNING THEORY
Learning by understanding analogies
[AD-A078123] N80-19793
LEAST SQUARES METHOD
A modification of Hudson's technique for piecewise linear regression models N80-19894
Trimming the least squares estimator in the linear model by using a preliminary estimator
[AD-A078115] N80-19820
LIBRARIES
Programming support library. Volume 1: Functional requirements
[AD-A079438] N80-19985
NLM online services reference manual
[PB80-114531] N80-19987
LIFE (DURABILITY)
Estimation of the endurance of civil aircraft wing structures — life estimate method for wing loading on general aviation aircraft
[ESDU-79024] N80-19060
LSA field test
[NASA-CR-162788] N80-19611
Advanced technology light weight fuel cell program — orbiting space vehicle long-life hydrogen oxygen fuel cell
[NASA-CR-159807] N80-19615
Lithium battery storage and discharge tests
[SAND-79-0869C] N80-19643
LIFE SCIENCES
Life sciences flight experiments program, life sciences project division, procurement quality provisions
[NASA-TM-80962] N80-19615
LIFE SUPPORT SYSTEMS
Development of a nitrogen generation system
[NASA-CR-152333] N80-19800
LIFTING BODIES
Trajectories optimization in hypersonic flight
[NASA-CR-162846] N80-19026
LIGHT AIRBORNE MULTIPURPOSE SYSTEM
Avionics logistics support including V/STOL, LAMPS, and instrument repair
[AD-A077460] N80-19087
LIGHT AIRCRAFT
HF communication to small low flying aircraft N80-19374
LIGHT SCATTERING
Experimental studies of multiple-scattered light from latex spheres — in rocket exhaust
[AD-A078322] N80-19191
LIGHT SOURCES
Development of quasi-homogeneous optical sources
[AD-A079297] N80-19952
LIGHT TRANSPORT AIRCRAFT
Aeroacoustic wind-tunnel tests of a light twin-boom general-aviation airplane with free or shrouded-pusher propellers — in the Langley full-scale tunnel
[NASA-TM-80203] N80-19023
LIGHTNING
Atmospheric electricity and military operations
[AD-A078482] N80-19693
LINE SPECTRA
Final state correlation effects in auger lineshapes: Application to silicon dioxide
[AD-A079037] N80-19221
Possibilities of using radiation in the oxygen absorption line at lambda = 2.53 mm on slant paths for thermal sounding of the atmosphere
[BLL-TRANS-1402-(9022.549)] N80-19881
LINEAR ARRAYS
The pointable multispectral linear array system and the large format camera for early 1980 shuttle payloads N80-20015
LINEAR EQUATIONS
A stochastic realization approach to the smoothing problem. Revised — linear systems
[AD-A079137] N80-19917
LINEAR FILTERS
Combining and updating of local estimates and regional maps along sets of one-dimensional tracks
[AD-A080034] N80-19902
LINEAR PREDICTION
Prediction intervals for first order Markov processes
[AD-A079283] N80-19918
On the asymptotic normality of robust regression estimates
[AD-A077888] N80-19922
LINEAR PROGRAMMING
Solution of the integer concave program using the ICON algorithm, volume 1
[AD-A077842] N80-19871
A bounding technique for integer linear programming with bi-ary variables
[AD-A075575] N80-19882
LINEAR SYSTEMS
A stochastic realization approach to the smoothing problem. Revised — linear systems
[AD-A079137] N80-19917
LINGUISTICS
Structures in aeronautical phraseology: From English to Spanish N80-19978
LIPID METABOLISM
Rat plasma and tissue lipids after a long-term space flight N80-19773
LIPSCHITZ CONDITION
Dispersion mapping theorems
[AD-A079704] N80-19907
LIQUID AMMONIA
X-ray absorption studies of graphite intercalates and metal ammonia solutions
[LBL-9940] N80-19212
LIQUID ATOMIZATION
Atomization of a liquid by a spray nozzle
[NASA-TM-75771] N80-19447
LIQUID FILLED SHELLS
Navier-Stokes solutions for spin-up from rest in a cylindrical container
[AD-A077115] N80-19455
Hydroelastic vibration analysis of partially liquid-filled shells using a series representation of the liquid
[NASA-TP-1558] N80-19583
LIQUID OXYGEN
Advanced oxygen-hydrocarbon rocket engine study
[NASA-CR-161390] N80-19186
LIQUID PHASES
Characterization of LPE grown HgCdTe by ion scattering spectrometry
[AD-A077884] N80-19968
LIQUID PROPELLANT ROCKET ENGINES
Advanced oxygen-hydrocarbon rocket engine study
[NASA-CR-161390] N80-19186
LIQUID ROCKET PROPELLANTS
Bipropellant engine plume contamination program. Volume 2: Chamber measurements, phase 2
[AD-A077435] N80-19187
Bipropellant engine plume contamination program. Volume 1: Chamber measurements, phase 1
[AD-A078412] N80-19188
LIQUIDUS
The liquidus surface of the aluminum-titanium-boron phase diagram at the aluminum corner
[BLL-RTS-11695] N80-19235
LITHIUM SULFUR BATTERIES
Investigations of the safety of Li/SOCl2 batteries
[AD-A077894] N80-19635
Lithium battery storage and discharge tests
[SAND-79-0869C] N80-19643
LIVER
Effect of graded physical load on the state of the liver from morphometric data and biochemical blood indices of rats against a background of hypokinesia
[NASA-TM-75969] N80-19750
LOADS (FORCES)
Development of a normalized probability distribution for lateral load factors due to aircraft ground turning
[AD-A077047] N80-19070
Representation of time dependent mechanical behavior of rene 95 by constitutive equations
[AD-A077271] N80-19250
Effect of engine operating environments on lubricant load carrying capacity of high gear load oils
[AD-A078421] N80-19278
LOCKS (FASTENERS)
High temperature penetrator assembly with bayonet plug and ramp-activated lock
[NASA-CASE-MSC-18528-1] N80-19488
LOG PERIODIC ANTENNAS
Terrain effects on log-periodic antenna characteristics using the singularity expansion method N80-19349
LOGISTICS
Integrated logistics support adds another dimension to matrix management N80-19555
MEK: A new procedure for development of maintenances policies — in logistics management and cost estimates for weapon systems N80-19558
The importance of integrated logistics support considerations during design N80-19557
Computer simulation model of the logistic support system for electrical engineering test equipment N80-19560
LOGISTICS MANAGEMENT
Balloon systems and launch support
[AD-A075385] N80-19037
Avionics logistics support including V/STOL, LAMPS, and instrument repair
[AD-A077460] N80-19087
Integrated logistics support adds another dimension to matrix management N80-19555
MEK: A new procedure for development of maintenances policies — in logistics management and cost estimates for weapon systems N80-19558
The importance of integrated logistics support considerations during design N80-19557
LONG DURATION SPACE FLIGHT
Scheduling work and rest periods during long-term space flights N80-19758
Effects of flights differing in duration on protein composition of cosmonauts blood N80-19757
Effects of long-term space flights on reactions of adrenal cortex and medulla N80-19759
LONG TERM EFFECTS
The long term impact of atmospheric carbon dioxide on climate
[SAN/115-136/2] N80-19740
LONGITUDINAL STABILITY
Digital computer solution of aircraft longitudinal and lateral directional dynamic characteristics
[AD-A078672] N80-19068
Handling quality requirements for advanced aircraft design longitudinal mode
[AD-A077658] N80-19128
LOOP ANTENNAS
Comparison of loop and dipole antennas in leaky feeder communication systems N80-19412
LORAN C
Application of Loran-C positioning to hydrographic surveying
[AD-A078278] N80-19057
Loran-C pulse transient propagation. Part 1: Geophysical and geological data base evaluation for Loran-C ground wave propagation medium. Part 2: Loran-C ground wave secondary phase corrections over nonhomogeneous propagation techniques. Part 3: An experimental program to measure ECD and test the transient solution, with addendum
[AD-A077551] N80-19058
LOW ALTITUDE
Aircraft icing during low-level flights
[AD-A078843] N80-19052
Prediction of radar coverage against very low altitude aircraft N80-19364
HF communication to small low flying aircraft N80-19374
Modern HF communications for low flying aircraft N80-19375
LOW COST
Low-cost bus-tunnels to the central business district
[UMTA-CA-06-0116-79-1] N80-19990
LOW PASS FILTERS
An active filter primer
[AD-A078847] N80-19439
LOW SPEED
Investigation of the airflow at rocket trajectory and wind sensor locations of a model helicopter simulating low speed flight. Application of model helicopter testing, laser velocity, and rotor wake flow visualization to investigate the aerodynamic interference at rocket trajectories and wind sensors of a helicopter operating in low speed flight
[AD-A075378] N80-19039
LUBRICATING OILS
Accuracy and repeatability indices for joint oil analysis program data
[AD-A078156] N80-19266

Effect of engine operating environments on lubricant load carrying capacity of high gear load oils
[AD-A078421] N80-19278
Ferrographic and spectrographic analysis of oil sampled before and after failure of a jet engine
[NASA-TM-81430] N80-19497
LUMINOUS INTENSITY
Consequences of intensity constraints on inertial confinement fusion
[UCRL-83342] N80-19961
LUNAR TIDES
Basic findings helpful for ionospheric predictions — lunar tides in the F region N80-19387
LUNGS
A continuum model of protein transport across the endothelium in the lungs and in the body of humans N80-19776
LYMPHOCYTES
Effects of 25 and 50 MeV protons on human peripheral blood lymphocyte chromosones in vitro N80-19767

M

MACHINING
Machining flaws and the strength grain size behavior of ceramics
[AD-A077536] N80-19277
Improving the performance and accuracy of external cylindrical grinding N80-19313
MAGNESIUM ALLOYS
The corrosion fatigue behavior of a high purity Al-Zn-Mg-Cu alloy
[AD-A077461] N80-19247
MAGNETIC DIPOLES
Fields from a vertical magnetic dipole
[SAND-79-0449] N80-19695
MAGNETIC FIELDS
Nonequilibrium phenomena in superconducting phase-slip centers
[AD-A078441] N80-19442
Study of radioprotective effect of high-intensity magnetic fields on mammalian cell cultures N80-19776
Studies of the effects of stationary magnetic fields on rat erythron N80-19777
MAGNETIC FLUX
A linear magnetic motor/generator — to generate electric energy using magnetic flux for spacecraft's power supply
[NASA-CASE-GSC-12518-1] N80-19424
Magnetosheath effects on cylindrical Langmuir probes
[NASA-CR-162952] N80-19958
Interplanetary medium data book, supplement, 1975 - 1978
[NASA-TM-80758] N80-19997
MAGNETIC MATERIALS
Development of a low loss magnetic composite utilizing amorphous metal flakes
[CONS-3205-T2] N80-19213
MAGNETIC MIRRORS
Magnetic mirror confinement of high-energy, high-density plasma
[UCRL-82790] N80-19959
MAGNETIC MOMENTS
Magnetic moment versus temperature curves of rare-earth iron garnets
[AD-A077356] N80-19970
MAGNETIC PUMPING
The theory of free electron lasers
[AD-A075363] N80-19482
MAGNETIC STORMS
Coupling between the neutral and ionized upper atmosphere during disturbed conditions N80-19386
MAGNETIC TAPES
TI-59 magnetic card calculator solutions to composite materials formulas
[AD-A078043] N80-19208
MAGNETOHYDRODYNAMIC GENERATORS
Magnetohydrodynamic (MHD) magnet modeling
[AD-A078865] N80-19443
MAGNETOHYDRODYNAMIC STABILITY
Theory of the resistive hose instability in relativistic electron beams — magnetohydrodynamic instability of a relativistic electron beam propagating in a preionized plasma
[AD-A078159] N80-19936
MAGNETOSPHERE
Magnetospheric research
[NASA-CR-161410] N80-19684
Ionospheric-Magnetospheric Plasma Experiment (IMPE)
[AD-A078082] N80-19687
MAGNETS
Miniature synchronous motors with permanent magnet rotors
[BLL-RTS-11801] N80-19423
Design, construction and testing of a magnetic electron spectrometer for detecting electrons to 10 MeV, including a preliminary design for a flight unit
[AD-A078516] N80-19472
MAINE
Cataract hydroelectric development expansion study
[DOE/ID-01796-1] N80-19680
MAINTAINABILITY
Avionics Reliability, Its Techniques and Related Disciplines — conference
[AGARD-CP-281] N80-19519
An analysis of the evolution of the reliability and maintainability disciplines N80-19520
A new approach to maintainability prediction — avionics, ground, and shipboard electronics N80-19537
Application of the lognormal distribution to corrective maintenance downtimes N80-19545
The integrated management of reliability and maintainability in procurement N80-19558
MAINTENANCE
Application of the lognormal distribution to corrective maintenance downtimes N80-19545
MEK: A new procedure for development of maintenances policies — in logistics management and cost estimates for weapon systems N80-19556
Evaluation of operation and maintenance factors limiting biological wastewater treatment plant performance
[PB80-108947] N80-19993
MAN MACHINE SYSTEMS
Closed loop models for analyzing engineering requirements for simulators
[NASA-CR-2965] N80-19063
Software reliability: Understanding and improving it N80-19548
Initial studies in objective forecasting of mesoscale weather using interactive computer system
[AD-A077343] N80-19718
Toward a remotely-manned energy and production economy
[AD-A078069] N80-19804
Real-time simulation: An indispensable but overused evaluation technique N80-19820
Modeling the human operator: Applications to system cost effectiveness N80-19846
Computer aided evolutionary design for digital integrated systems
[AD-A078124] N80-19865
The use of multimedia and programmed teaching machines for remote sensing education N80-20012
Computer applications in remote sensing education N80-20013
MANAGEMENT INFORMATION SYSTEMS
Reliability and support data for statistical evaluation — using a management information system N80-19559
MANAGEMENT METHODS
Integrated logistics support adds another dimension to matrix management N80-19555
The integrated management of reliability and maintainability in procurement N80-19558
The reliability improvement warranty and its application to the F-16 multinational fighter program N80-19561
Performance measurement system: Recent systems development and applications
[HEDL-SA-1826-FP] N80-19924
MANAGEMENT PLANNING
Estimating the time required to transition aircraft fleets to new scheduled maintenance intervals
[AD-A078606] N80-19027
Federal weather modification efforts need congressional attention
[PB80-106511] N80-19742
MANGANESE COMPOUNDS
Stability to heat treatment of nickel-manganese deposits containing sulphur
[BLL-RTS-11591] N80-19234
MANNED SPACE FLIGHT
USSR report: Space biology and aerospace medicine, v. 14, no.1
[JPRS-75251] N80-19755
Development of a nitrogen generation system
[NASA-CR-152333] N80-19900
MANPOWER
Human work measurement. A bibliography with abstracts
[PB80-903186] N80-19807
MAPPING
Representation of hydrographic surveys and ocean bottom topography by analytical models
[AD-A078282] N80-19746
Combining and updating of local estimates and regional maps along sets of one-dimensional tracks
[AD-A080034] N80-19902
MAPS
Color ink-jet demonstration program
[AD-A075377] N80-19476
Non-point source - stream nutrient level relationships: A nationwide study. Supplement 1: Nutrient map reliability
[PB80-112691] N80-19879
MARINE ENVIRONMENTS
Atlas of Naval operational environments: The natural marine environment
[AD-A077033] N80-19723
MARINE METEOROLOGY
Atlas of Naval operational environments: The natural marine environment
[AD-A077033] N80-19723
Equatorial Pacific Ocean variability: Seasonal and El Nino times scales
[AD-A077031] N80-19724
MARKOV PROCESSES
Markovian availability model for a network of communicating computers N80-19525
Prediction intervals for first order Markov processes
[AD-A078283] N80-19918
MASS SPECTROMETERS
Characterization of tungsten dispenser cathodes using ISS and SIMS
[AD-A077592] N80-19428
An RF oscillator for rocket-borne and balloon-borne quadrupole mass spectrometers
[AD-A078797] N80-19473
Ionospheric-Magnetospheric Plasma Experiment (IMPE)
[AD-A078082] N80-19687
MATERIALS TESTS
Advanced materials for space N80-19172
Evaluation of SRM flex bearing materials and processes
[NASA-TM-78286] N80-19284
MATHEMATICAL MODELS
An analytical and experimental study of aircraft hydraulic lines including the effect of mean flow
[AD-A079746] N80-19079
Identification evaluation methods N80-19096
Identification experience in extreme flight regimes N80-19102
Evaluation of a locally homogeneous flow model of spray combustion
[NASA-CR-3202] N80-19283
Evaporation and dispersion of hazardous materials
[AD-A077399] N80-19291
Multipath analysis of ILS glide path N80-19354
Theoretical modeling and experimental data matching for active and passive microwave remote sensing of Earth terrain N80-19360
Some of the problems in digital terrain model construction N80-19361
The influence of ionospheric models on calculations of decametric wave propagation N80-19383
Recent advances in HF propagation simulation N80-19392
An efficient rotational nonequilibrium model of a cw chemical laser
[AD-A078485] N80-19487
Modeling of the hot isostatic pressing process — for metal forming techniques with metal powder
[AD-A078162] N80-19502
Reliability growth models N80-19522
Trends in reliability modeling technology for fault tolerant systems N80-19534
Dynamic structural model of a submerged ring
[AD-A078157] N80-19568

Damping Effects in Aerospace Structures [AGARD-CP-277] N80-19572
Mathematical formulation of damping for structural response analysis N80-19573
Numerical modeling of structures to account for internal damping N80-19575
Modeling the space conditioning energy demand of a community as a function of weather [COO-1340-65] N80-19644
Mathematical models for atmospheric pollutants. Appendix B: Chemical and physical properties of gases and aerosols [EPRI-EA-1131-APP-B] N80-19667
User's guide to the ELSTAR photochemical air quality simulation model [PB80-109194] N80-19675
Model computations of radio wave scintillation caused by equatorial bubbles [AD-A077028] N80-19690
Calculations using a model, of the seasonal variation in the concentration of nitrogen compounds in the temperate stratosphere [BLL-TRANS-1400-(9022.549)] N80-19700
Stability analysis of kinetic models of the global C-cycle: Exchange of carbon between land biota and atmosphere under the influence of man [BLL-TRANS-1421-(9022.549)] N80-19702
Some models for ceiling [AD-A079033] N80-19707
Some additional models for rainfall [AD-A077872] N80-19709
CLOUDS [AD-A079363] N80-19716
A new model for sky cover [AD-A079366] N80-19717
Some models for windspeed [AD-A077048] N80-19722
Representation of hydrographic surveys and ocean bottom topography by analytical models [AD-A078262] N80-19746
Modeling and Simulation of Avionics Systems and Command, Control and Communications systems — conferences [AGARD-CP-288] N80-19809
Verification and validation of avionic simulations N80-19814
Simulation of overall air defense command and control N80-19815
Theater air defense engagement simulation-command/control/communications ns-C3I): An approach to theater air defense model/methodology development N80-19817
Simulation of air defence operations and multiple air combat N80-19818
The application of modeling and simulation to the development of the E-3A N80-19823
Constructions in geometry problem solving [AD-A076338] N80-19904
Some models for visibility [AD-A075490] N80-19950
An approach for providing more accurate probability assessments [AD-A077994] N80-19979

MATRICES (MATHEMATICS)
Balancing the generalized eigenvalue problem [ORNL/CSD-47] N80-19910
Dispersion, patterned and structured matrices: Vec operators and related topics N80-19914

MATRIX THEORY
Fast algorithms for solving Toeplitz system of equations and finding Rational Hermite Interpolants [AD-A075376] N80-19901
Dispersion, patterned and structured matrices: Vec operators and related topics N80-19914

MAXIMUM LIKELIHOOD ESTIMATES
Aircraft identification experience N80-19100
Delta-exact lower confidence bounds for series system reliability [AD-A077524] N80-19923

MAXIMUM USABLE FREQUENCY
Comparison of measured and predicted MUF's at a remote location — high frequency radio transmitters N80-19378
On determining the Maximum Usable Frequency (MUF) N80-19388

MAXWELL-BOLTZMANN DENSITY FUNCTION
Spacecraft charging model: Two Maxwellian approximation [AD-A077907] N80-19174

MEASURING INSTRUMENTS
Water quality monitor — spacecraft potable water [NASA-CR-160412] N80-19963
A device for determining the intensity of partial sweating [NASA-TM-75429] N80-19901
Journal of Research of the National Bureau of Standards, volume 84, no. 5 — results of research in physical and engineering sciences with emphasis on measurement and standardization [PB80-103674] N80-20022

MECHANICAL DRIVES
Ideal spiral bevel gears: A new approach to surface geometry [NASA-TM-81448] N80-19498

MECHANICAL PROPERTIES
Structure and properties of cast alloys [AD-A077430] N80-19248
The effect of seawater on polymers [AD-A077324] N80-19281
Moisture effects on the mechanical properties of Hercules 3501-6 epoxy resin [AD-A079616] N80-19282

MECHANIZATION
General methods to enable robots with vision to acquire, orient and transport workpieces [PB80-108388] N80-19606

MEDICAL SCIENCE
NLM online services reference manual [PB80-114531] N80-19967

MEDITERRANEAN SEA
Sea surface temperature of the coastal zones of France. Heat Capacity Mapping Mission (HCMM) [E80-10057] N80-19585

MEMBRANES
Method of forming dynamic membrane on stainless steel support [NASA-CASE-MSC-18172-1] N80-19237

MENTAL HEALTH
Evaluation and forecasting of mental fitness of flight personnel in the presence of neurosis N80-19770

MERCURY TELLURIDES
Characterization of LPE grown HgCdTe by ion scattering spectrometry [AD-A077884] N80-19968

MESOSCALE PHENOMENA
Initial studies in objective forecasting of mesoscale weather using interactive computer system [AD-A077343] N80-19718
Winter shamal in the Persian Gulf [AD-A077727] N80-19720

METABOLISM
Metabolism during hypodynamia [NASA-TM-75686] N80-19785

METAL BONDING
Surface treatment for aluminum bonding [AD-A078950] N80-19254
Hydrogen in HY-130 weld metal [AD-A077574] N80-19606

METAL COATINGS
Testing the contact characteristics of electro-deposited coatings, part 1 — corrosion tests [BLL-RTS-11908] N80-19514

METAL CRYSTALS
Determinations of electronic states in crystalline semiconductors and metals by angle-resolved photoemission [LBL-9429] N80-19972

METAL FATIGUE
Stress corrosion of stainless steels, volume 2. Citations from the Engineering Index data base [PB80-803208] N80-19257
Stress corrosion of stainless steels, volume 2. Citations from the NTIS data base [PB80-803190] N80-19258

METAL GRINDING
Improving the performance and accuracy of external cylindrical grinding N80-19313

METAL HYDRIDES
Moessbauer effect investigations of the electronic and magnetic properties of rare earth metals and intermetallic hydrides [CONF-790738-4] N80-19973

METAL JOINTS
Characteristics of mechanically fastened joints of CIP/HIP-1 Beryllium [AD-A078275] N80-19500

METAL MATRIX COMPOSITES
Development of a low loss magnetic composite utilizing amorphous metal flakes [CONS-3205-T2] N80-19213

METAL OXIDES
Sintering of beta silicon nitride solid solutions containing metal oxide [AD-A077415] N80-19209
Method of forming dynamic membrane on stainless steel support [NASA-CASE-MSC-18172-1] N80-19237
Methanol and methyl fuel catalysts [FE-3177-4] N80-19302

METAL PARTICLES
Development of a low loss magnetic composite utilizing amorphous metal flakes [CONS-3205-T2] N80-19213

METAL POWDER
Modeling of the hot isostatic pressing process — for metal forming techniques with metal powder [AD-A078162] N80-19502
Development of economical improved thick film solar cell contact [NASA-CR-162949] N80-19619

METAL SURFACES
Development of surface interactions at polymer-metal interfaces [AD-A077276] N80-19250
Photodesorption of gases from metal and semiconductor surfaces N80-19964

METAL WORKING
Modeling of the hot isostatic pressing process — for metal forming techniques with metal powder [AD-A078162] N80-19502

METAL-METAL BONDING
Sealing techniques for ultra-high vacuum systems — soldering techniques for metal to metal bonding and metal to nonmetal bonding [BLL-RTS-11896] N80-19312

METALLIC GLASSES
Glass shell manufacturing in space — residual gases in spherical shells made from metal-organic gels [NASA-CR-161408] N80-19141

METALLIZING
Microcracks and metallization burnout [AD-A078019] N80-19430
A new method of metallization for silicon solar cells [NASA-CR-162823] N80-19620

METASTABLE STATE
Crystal growth and phase stability of metastable indium antimonide bismide thin films N80-19965

METEOROLOGICAL CHARTS
NOAA satellite monitoring of snow cover in the Northern Hemisphere during the winter of 1977 N80-19594

METEOROLOGICAL INSTRUMENTS
Preliminary assessment of an automated system for detecting present weather [AD-A079031] N80-19706

METEOROLOGICAL PARAMETERS
Guide to standard weather summaries and climatic services [AD-A078660] N80-19708
Some additional models for rainfall [AD-A077872] N80-19709
Multispectral cloud identification study [AD-A077873] N80-19710
The 19702A GSRS, missile number 310, round number B-33, 27 August 1979 [AD-A079990] N80-19726
The 19702A GSRS, Missile Number BR-3, Round Number B-35, 31 August 1979 [AD-A079991] N80-19727
The 19702A GSRS, missile numbers 308, 309, round numbers B-31, B-32, 18 August 1979 [AD-A079992] N80-19728
The 19305B GSRS, Missile Numbers 1043, 1045, Round Numbers V-64, V-65, 17 August 1979 [AD-A079993] N80-19729
The 190702A GSRS, Missile Number 004, Round Number B-30, 17 August 1979 [AD-A079999] N80-19730
The 19702D GSRS, Missile Number 023, Round Number B-38, 8 September 1979 [AD-A080000] N80-19731
The 12821A Lance, Missile Number 4819, Round Number 335 NCL, 13 August 1979 [AD-A079995] N80-19732

The 19702A GSRS, missile number 311, round number B-39, 10 September 1979: Meteorological Data Report
[AD-A080001] N80-19733
The 19304D GSRS, missile number 1063, round number V-67, 29 August 1979: Meteorological Data Report
[AD-A080062] N80-19734
A comparative analysis of Rawinsonde and Nimbus-6 and Tiros-N satellite profile data
[AD-A079295] N80-19737
Analyzing historical meteorological data for air quality analysis
[PB80-107154] N80-19743

METEOROLOGICAL RADAR
HF skywave radar estimates of the track, surface wind and waves of hurricane Anita N80-19403
An investigation of radar returns and their relationship to severe weather occurrences — the use of meteorological radar and radar signatures to predict thunderstorms
[AD-A079658] N80-19714

METEOROLOGICAL SATELLITES
Satellite training course notes. Part 4: Cloud patterns and the upper air wing field
[AD-A077557] N80-19712

METEOROLOGY
Weather modification effects and management. A bibliography with abstracts
[PB80-802796] N80-19744

METHANE
Hydrogen and methane syntheses through radiation catalysis N80-19297

METHYL ALCOHOLS
Methanol as a transportation fuel: Assessment of environmental and health research
[UCRL-52697] N80-19295
Methanol and methyl fuel catalysts
[FE-3177-4] N80-19302

METHYLENE BLUE
Photochemical transients of electrode bound methylene blue
[AD-A079906] N80-19218

MICHIGAN
Use of remote sensing for land use policy formulation — Kalamazoo, Lake, Mecosta, Newaygo, Osceola, and Wexford counties, Michigan
[E80-10085] N80-19592
Statistical analysis of terrain and water (ice) backgrounds in a winter scene from northern Michigan
[AD-A077554] N80-19598

MICROBIOLOGY
NASA standard procedures for the microbiological examination of space hardware
[NASA-TM-80756] N80-19749

MICROCRACKS
Microcracks and metallization burnout
[AD-A078019] N80-19430

MICROELECTRONICS
Micro-electronic systems reliability prediction N80-19524
Advanced electronic technology
[AD-A077589] N80-20021

MICROPROCESSORS
Microprocessor controlled ejection seat
[AD-A077479] N80-19049
Microprocessor control of low speed V/STOL flight
[AD-A077661] N80-19129
Security kernel design for a micro-processor-based, multilevel archival storage system
[AD-A078281] N80-19848

MICROPROGRAMMING
Emulation applied to reliability analysis of reconfigurable, highly reliable, fault-tolerant computing systems N80-19541

MICROSCOPY
Acoustic microscopy for nondestructive evaluation of materials
[AD-A078088] N80-19516
Integrated optics for rf spectrum analysis and acoustic microscopy for the study of material joints N80-19940

MICROSTRUCTURE
Structure and properties of cast alloys
[AD-A077430] N80-19246

MICROWAVE AMPLIFIERS
S-BAND MIC TRAPATT amplifier
[BLL-RTS-11884] N80-19420
W-J band low-cost crossed-field amplifier
[AD-A077322] N80-19436
Monolithic microwave preamplifier
[AD-A078522] N80-19441

MICROWAVE ANTENNAS
The geometry of the 37-ele microwave antenna support structure
[NASA-CR-162847] N80-19321

MICROWAVE LANDING SYSTEMS
A flight simulation investigation on the feasibility of curved approaches under MLS guidance N80-19844
Modeling and flight simulation of an active configured aircraft under M.L.S. guidance N80-19845

MICROWAVE RADIOMETERS
Theoretical modelling and experimental data matching for active and passive microwave remote sensing of Earth terrain N80-19360
SMMR simulator radiative transfer calibration model. 1: Derivation
[E80-10081] N80-19589

MICROWAVE SPECTROMETERS
CAMAC system for computer control of microwave spectrometers
[LBL-8276] N80-19230

MICROWAVES
Submillimeter wave spectroscopy and technology — optically-pumped laser spectroscopy
[AD-A078003] N80-19222

MILITARY AIR FACILITIES
The history of static test and Air Force structures testing
[AD-A077029] N80-19138

MILITARY AIRCRAFT
Military aircraft and missile technology at the Langley Research Center: A selected bibliography
[NASA-TM-80204] N80-19024
Military adaption of a commercial VOR/ILS airborne radio with a reliability improvement warranty N80-19540

MILITARY HELICOPTERS
Design of a simulator for studying the helicopter - SDVEH N80-19829

MILITARY OPERATIONS
Atmospheric electricity and military operations
[AD-A078482] N80-19693
Representing human thought and response in military conflict simulation models N80-19813
Objectives for building an experimental CCIS N80-19815
Theater air defense engagement simulation-command/control/communications ns-C3): An approach to theater air defense model/methodology development N80-19817
Simulation of air defence operations and multiple air combat N80-19818

MILITARY TECHNOLOGY
Viscoelastic damping in USAF applications N80-19582
Air Force Flight Dynamics Laboratory fiscal year 1981. Technical objective document
[AD-A078973] N80-20020

MINERAL EXPLORATION
Video processing of remote sensor data applied to uranium exploration in Wyoming
[GJBX-171(79)] N80-19603

MINES (EXCAVATIONS)
Principles of HF communication in tunnels using open transmission lines and leaky cables N80-19405

MINIMA
GLOBALMIN: A computer program for global optimization
[AD-A078089] N80-19870

MISSILE LAUNCHERS
Rocket motor blast effects and proposed ablative protection for RAM launching system EX 43
[AD-A077037] N80-19190

MISSILE RANGES
Range vernier
[AD-A077178] N80-19335

MISSILE SYSTEMS
Reliability investigations on an automatic test system — for an air-to-ship missile system N80-19544

MISSILES
Military aircraft and missile technology at the Langley Research Center: A selected bibliography
[NASA-TM-80204] N80-19024
Wind tunnel tests of a spinning 105 mm artillery shell model with canard control surfaces
[AR-001-908] N80-19032
Demonstration program for a flexible duct valve for ramjet engine fuel controls
[AD-A079529] N80-19123
The 19702A GSRS, missile number 310, round number B-33, 27 August 1979
[AD-A079990] N80-19726
The 19702A GSRS, Missile Number BR-3, Round Number B-35, 31 August 1979
[AD-A079991] N80-19727
The 19702A GSRS, missile numbers 308, 309, round numbers B-31, B-32, 18 August 1979
[AD-A079992] N80-19728
The 19306B GSRS, Missile Numbers 1043, 1045, Round Numbers V-64, V-65, 17 August 1979
[AD-A079993] N80-19729
The 19702A GSRS, Missile Number 004, Round Number B-30, 17 August 1979
[AD-A079999] N80-19730
The 19702D GSRS, Missile Number 023, Round Number B-38, 6 September 1979
[AD-A080000] N80-19731
The 19702A GSRS, missile number 311, round number B-39, 10 September 1979: Meteorological Data Report
[AD-A080001] N80-19733
The 19304D GSRS, missile number 1063, round number V-67, 29 August 1979: Meteorological Data Report
[AD-A080062] N80-19734

MISSION PLANNING
Orbiter fuel cell performance constraints. STS/OPS Pratt Whitney fuel cells. Operating limits for mission planning
[NASA-TM-80958] N80-19810

MISSOURI RIVER (US)
Remote sensing applications to resource problems in South Dakota — Chamberlain, Rapid City, Watertown; Spink County; Lake Herman and Six-Mile Creek Watersheds; and Missouri River waterfowl
[E80-10086] N80-19580

MODAL RESPONSE
Mathematical formulation of damping for structural response analysis N80-19573

MODE TRANSFORMERS
Mode converters for HF tunnels transmission N80-19408

MODELS
Solid-state switch modeling N80-19189
Magnetohydrodynamic (MHD) magnet modeling
[AD-A078865] N80-19443
Computer simulation model of the logistic support system for electrical engineering test equipment N80-19560
Avionics evaluation program: Simulation models for the effectiveness analysis of avionics N80-19838

MODES
Dual beam dual mode TWT
[AD-A077576] N80-19433

MODULUS OF ELASTICITY
Determination of the technical constants of laminates in oblique directions
[NASA-TM-75719] N80-19207
Surface settlement of a finite elastic layer whose modulus increases linearly with depth
[PB80-112899] N80-19571

MOISTURE
Moisture effects on the mechanical properties of Hercules 3501-6 epoxy resin
[AD-A078616] N80-19282

MOISTURE CONTENT
Moisture movement and moisture equilibria in pavement systems
[PB80-120082] N80-19314
A critical comparison of remote sensing and other methods for nondestructive estimation of standing crop biomass
[E80-10082] N80-19590

MOLECULAR INTERACTIONS
The effect of seawater on polymers
[AD-A077324] N80-19281

MOLECULAR RELAXATION
Picosecond laser studies of aromatic radical ions
[AD-A078721] N80-19219

MOLECULAR STRUCTURE
Small-molecule cyclic models for the synthesis of new polyphosphazenes side group construction via lithiophenoxy derivatives
[AD-A078193] N80-19192
Formation of organosilicon compounds. 59: Synthesis of a carbosilane with propellane structure
[RAE-LIB-TRANS-2029] N80-19285
Comparison of crystallinity and molecular orientation between surface and bulk of some polymers by FTIR-ATR and transmission spectroscopy — polyethylene and polypropylene
[AD-A078243] N80-19289
MOLECULES
Ways to inorganic polymers
[BLL-RTS-11806] N80-19262
MOLTEN SALTS
Electrochemistry of solutes in chloroaluminate melts and the development of related electrochemical methodology
[AD-A078242] N80-19923
MOLYBDENUM
A new method of metallization for silicon solar cells
[NASA-CR-162823] N80-19920
MOM (SEMICONDUCTORS)
Military Adaptation of Commercial Item (MACI) program on Electrically Alterable Read Only Memory (EAROM) — metal-nitride-oxide semiconductors
[AD-A078594] N80-19851
MOMENTUM TRANSFER
Memory effects in turbulence
[NASA-TM-75516] N80-19451
MONOCULAR VISION
Effect of field of view and monocular viewing on angular size judgements in an outdoor scene
[NASA-TM-81176] N80-19792
MONTANA
Potential hydroelectric power, vertical turbine, spillway combine Broadwater Dam
[DOE/ID-01822-1] N80-19651
MONTE CARLO METHOD
Monte Carlo simulation for integrated circuits
[BLL-RTS-11885] N80-19421
MORPHOLOGY
Determination of morphology and electronic structure in solids with 20-1000 eV radiation — techniques of photon absorption and photoemission for spectroscopic analysis of materials
[LBL-8482] N80-19971
MOSSBAUER EFFECT
Mossebauer effect investigations of the electronic and magnetic properties of rare earth metals and intermetallic hydrides
[CONF-790730-4] N80-19973
MOTION PICTURES
Aviation training using video disk technology N80-19629
MOTION SICKNESS
Effect of sodium bicarbonate on reactivity and trophics of vestibular analyzer N80-19769
MOTOR VEHICLES
Mobile source NOx monitor, hydrogen-atom direct chemiluminescence method
[PB80-102759] N80-19670
Low-cost bus-tunnels to the central business district
[UMTA-CA-06-0116-79-1] N80-19990
MOUNTAINS
Multisensor analysis of hydrologic features in the Wind River Range, Wyoming with emphasis on the SEASAT SAR
[E80-10063] N80-19591
MULTIPATH TRANSMISSION
Experimental measurements of ground reflection elevation multipath characteristics and its effects on a small aperture elevation tracking radar
[AD-A077915] N80-19327
Multipath analysis of ILS glide path N80-19354
Airborne measurements of electromagnetic wave reflections from land and sea water N80-19355
Theoretical distribution functions of multipath propagation and their parameters for mobile radio communication in quasi-smooth terrain N80-19358
An experimental investigation of multi-path scattering at L-band N80-19370
Diffraction phenomena during multipath fading N80-19371
MULTIPOLAR FIELDS
Theoretical aspects of transient radiation and scattering in lossless two medium half spaces N80-19357
MULTISPECTRAL BAND SCANNERS
Landsat MSS coordinate transformations — determining satellite orbits
[AD-A078418] N80-19596
The pointable multispectral linear array system and the large format camera for early 1980 shuttle payloads N80-20015
MULTISPECTRAL PHOTOGRAPHY
Comparative study of anomalous gray-shade patterns in DMSP and LANDSAT imagery
[AD-A077902] N80-19595
Multispectral cloud identification study
[AD-A077873] N80-19710
MULTISTATIC RADAR
A unique radio oceanographic radar
[AD-A077364] N80-19332
MULTIVARIATE STATISTICAL ANALYSIS
Multistate reliability models and some extensions of a univariate shock model N80-19513
Dispersion, patterned and structured matrices: Vec operators and related topics N80-19914
MUSCULAR FUNCTION
Dynamics of stress reaction of rats during experimental hypokinesia varying in duration, and possibility of correction thereof N80-19771
MYOCARDIUM
Effect of hypoxia and hypercapnia on lactate and pyruvate levels in rat blood and myocardium N80-19775

N

N-TYPE SEMICONDUCTORS
A gas-sensitive semiconductor director for gas-chromatographic analysis
[BLL-RTS-11943] N80-19486
NAPHTHALENE
Kinetics and mechanism of desulfurization and denitrogenation of coal-derived liquids — quiciline, indole, dibenzothiophene, and naphthalene
[FE-2028-15] N80-19292
NASA PROGRAMS
The space science data service: A study of its efficiencies and costs
[NASA-TM-80760] N80-19982
NASA authorization, 1981, program review, volume 2
[GPO-58-220] N80-19986
NASA programs in technology transfer and their relation to remote sensing education N80-20009
NASA's western regional applications training activity N80-20010
NASTRAN
Investigation of fan blades shroud mechanical damping
[AD-A078439] N80-19120
NATURAL LANGUAGE (COMPUTERS)
Natural language processing, volume 1. Citations from the NTIS data base
[PB80-803281] N80-19883
Natural language processing, volume 2. Citations from the NTIS data base
[PB80-803299] N80-19884
Natural language processing. Citations from the Engineering Index data base
[PB80-803307] N80-19885
NAVIER-STOKES EQUATION
Navier-Stokes solutions for spin-up from rest in a cylindrical container
[AD-A077115] N80-19455
Numerical integration of compressible, viscous flow equations
[AD-A077558] N80-19457
NAVIGATION AIDS
Evolution of the orbital improvement program
[AD-A078842] N80-19143
NEODYMIUM LASERS
Development of the neodymium pentaphosphate (NPP) laser
[AD-A078603] N80-19486
NETHERLANDS
Simulation of air defence operations and multiple air combat N80-19818
NETWORK ANALYSIS
Design and analysis of interconnection networks for partitionable parallel processing systems
[AD-A078690] N80-19852
NEUROPHYSIOLOGY
Reaction of chickens to graduated length of exposure to stress
[NASA-TM-76071] N80-19754
Effect of hypokinesia on cardiac contractile function and nervous regulation of the heart
[NASA-TM-75970] N80-19783
NEUROSES
Evaluation and forecasting of mental fitness of flight personnel in the presence of neurosis N80-19770
NEUTRON SPECTRA
A note on the revised galactic neutron spectrum of the Ames collaborative study
[NASA-CR-150554] N80-20002
NEW HAMPSHIRE
Prototype overland flow test data: June 1977 - May 1978
[AD-A078743] N80-19597
NICKEL
The effect of nickel and nitrogen on void formation in vanadium N80-19232
NICKEL ALLOYS
The oxidation of graphitic monolayers on Ni(110)
[AD-A078512] N80-19210
Stability to heat treatment of nickel-manganese deposits containing sulphur
[BLL-RTS-11591] N80-19234
Structure and properties of cast alloys
[AD-A077430] N80-19248
Representation of time dependent mechanical behavior of rene 95 by constitutive equations
[AD-A077271] N80-19250
Alloy development of oxide dispersion strengthened high volume gamma nickel-base superalloys made by mechanical alloying
[AD-A077615] N80-19252
NICKEL PLATE
Mechanical properties of electroplated nickel rings for bath aging study
[BDX-613-2303] N80-19256
NIGHT SKY
Direction and Doppler characteristics of medium and long path HF signals within the night-time sub-auroral region N80-19391
NIGHT VISION
Simulation of a night vision system for low level helicopter operations — using helmet mounted display device N80-19832
Display Working Group Joint DARCOM/NMC/AFLC/AFSC Panel on the Field of Night Vision Technology — conferences
[AD-A077061] N80-19951
NIMBUS 6 SATELLITE
Analyze, calculate, and develop techniques for weather satellite imagery data
[AD-A077292] N80-19735
A comparative analysis of Rawinsonde and Nimbus-6 and Tiros-N satellite profile data
[AD-A079295] N80-19737
NITRATES
Method of forming dynamic membrane on stainless steel support
[NASA-CASE-MSC-18172-1] N80-19237
NITRIC OXIDE
Nitric oxide ion and uranium oxide ion studies
[AD-A077870] N80-19688
NITROGEN
A theoretical analysis of simulated transonic boundary layers in cryogenic-nitrogen wind tunnels
[NASA-TP-1631] N80-19131
The effect of nickel and nitrogen on void formation in vanadium N80-19232
Non-point source - stream nutrient level relationships: A nationwide study. Supplement 1: Nutrient map reliability
[PB80-112691] N80-19679
Development of a nitrogen generation system
[NASA-CR-152333] N80-19800
NITROGEN COMPOUNDS
Calculations using a model, of the seasonal variation in the concentration of nitrogen compounds in the temperate stratosphere
[BLL-TRANS-1400-(9022.549)] N80-19700

NITROGEN OXIDES
Experimental assessment of nitrogen oxides transformations while sampling combustion products
[AD-A078080] N80-19220
Mobile source NOx monitor, hydrogen-atom direct chemiluminescence method
[PB80-102759] N80-19870
NOAA SATELLITES
NOAA satellite monitoring of snow cover in the Northern Hemisphere during the winter of 1977
N80-19594
NOISE (SOUND)
Effects of artillery noise on the hearing of protected crew personnel
[AD-A078664] N80-19805
NOISE PROPAGATION
A mobile HF impulse source locator — thunderstorm location and tracking N80-19414
NOISE THRESHOLD
Ku-band radar threshold analysis
[NASA-CR-160557] N80-19322
NONDESTRUCTIVE TESTS
Nondestructive evaluation of airport pavements. Volume 2: Operational manual for PAVBEN program at TOC
[AD-A079495] N80-19130
Failure causing defects in ceramics: What NDE should find
[AD-A078234] N80-19267
Acoustic microscopy for nondestructive evaluation of materials
[AD-A078088] N80-19516
Research on nondestructive testing
[AD-A078483] N80-19517
NONLINEAR EQUATIONS
Global bounds and approximations for nonlinear diffusion problems
[AD-A076343] N80-19507
Solving the non-linear equations of deep convection
[BLL-TRANS-1397-(9022.549)] N80-19680
Integration of nonlinear differential equations. A bibliography with abstracts
[PB80-802978] N80-19912
NONLINEAR PROGRAMMING
Solution of the integar concave program using the ICON algorithm, volume 1
[AD-A077842] N80-19571
NONLINEAR SYSTEMS
Nonlinear systems with Gaussian inputs: Representation, identification and inverse problems
[AD-A078597] N80-19900
NONLINEARITY
Simulation program of nonlinearities applied to telecommunication systems
[NASA-TM-75511] N80-19320
NORMAL DENSITY FUNCTIONS
On the influence of surface statistics, ground moisture content and wave polarization on the scattering of irregular terrain and on signal power spectra N80-19358
Application of the lognormal distribution to corrective maintenace downtimes N80-19545
On the asymptotic distribution of U-statistics
[AD-A078117] N80-19919
NORMALIZING (STATISTICS)
Note on normalization of variables and and equations
[UCID-18083] N80-19908
NORTH SEA
Sea surface temperature of the coastal zones of France. Heat Capacity Mapping Mission (HCMM)
[E80-10057] N80-19585
NORTHERN HEMISPHERE
NOAA satellite monitoring of snow cover in the Northern Hemisphere during the winter of 1977
N80-19594
NOZZLE FLOW
Visualization of unsteady jets and aerodynamic noise fields
[CUED/A-TURBO/TR-96] N80-19029
NUCLEAR FUSION
Magnetic mirror confinement of high-energy, high-density plasma
[UCRL-82790] N80-19959
NUCLEAR INTERACTIONS
Experiments on the nuclear interactions of pions
[ORO-4043-39] N80-19932
Nuclear phenomena and the short distance structure of hadrons
[SLAC-PUB-2395] N80-19933
NUCLEAR PHYSICS
Experiments on the nuclear interactions of pions
[ORO-4043-39] N80-19932
NUCLEAR PUMPED LASERS
Lasing characteristics of gas mixtures involving UFG: Application to nuclear pumping of lasers
[NASA-CR-163818] N80-19480
NUCLEAR STRUCTURE
Nuclear phenomena and the short distance structure of hadrons
[SLAC-PUB-2395] N80-19933
NUCLEONS
Field theory of pion-nucleus interactions
[DOE/ER-01388-775] N80-19931
NUMBER THEORY
On the weak law of large numbers D[0,1)
[AD-A078130] N80-19926
NUMERICAL ANALYSIS
An evaluation of the two-parameter momentum-integral laminar boundary layer calculation method of head
[AD-A077325] N80-19456
Numerical and data analysis techniques applied to scientific research, 3
[AD-A075383] N80-19674
NUMERICAL CONTROL
CAMAC system for computer control of microwave spectrometers
[LBL-8276] N80-19230
A new computer-controlled High Frequency direction-finding and transmitter locating system
N80-19415
Reliability investigations on an automatic test system — for an air-to-ship missile system N80-19544
NUMERICAL INTEGRATION
On determining the Maximum Usable Frequency (MUF) N80-19388
Numerical integration of compressible, viscous flow equations
[AD-A077558] N80-19457
Integration of nonlinear differential equations. A bibliography with abstracts
[PB80-802978] N80-19912
NUMERICAL WEATHER FORECASTING
Dynamic data assimilation by the noise freezing method
[AD-A077801] N80-19711

O

O RING SEALS
Damping in tapered annular seals for an incompressible fluid
[NASA-TP-1646] N80-19495
OATS
Use of remote sensing for land use policy formulation — Kalamazoo, Lake, Mecosta, Newaygo, Osceola, and Wexford counties, Michigan
[E80-10085] N80-19592
OBSERVATORIES
Investigation of magnetic field phenomena in the ionosphere
[AD-A075356] N80-19689
OCEAN BOTTOM
Electric field components in presence of a sea-sea bottom interface at ELF N80-19367
Representation of hydrographic surveys and ocean bottom topography by analytical models
[AD-A078282] N80-19746
OCEAN DATA ACQUISITIONS SYSTEMS
Atlas of Naval operational environments: The natural marine environment
[AD-A077033] N80-19723
OCEAN SURFACE
A system for using radar to record wave direction
[AD-A076307] N80-19342
Sea-state directional spectra observed by HF Doppler radar N80-19401
Ocean swell parameters from narrow-beam HF radar sea echo N80-19404
Sea surface temperature of the coastal zones of France. Heat Capacity Mapping Mission (HCMM)
[E80-10057] N80-19585
SMMR simulator radiative transfer calibration model. 1: Derivation
[E80-10081] N80-19589
OCEAN THERMAL ENERGY CONVERSION
Data analysis for Ocean Thermal Energy Conversion (OTEC)
[AD-A077908] N80-19838
Solar sea power plants. Citations from the NTIS data base
[PB80-802580] N80-19661
Solar seapower plants. Citations from the Engineering Index data base
[PB80-802596] N80-19662
OCEANOGRAPHIC PARAMETERS
Data analysis for Ocean Thermal Energy Conversion (OTEC)
[AD-A077908] N80-19838
Coastal water temperature in the southeastern portion of Brazil utilizing oceanographic data and NOAA sensor data, volume 2
[INPE-1589-RPE/070-VOL-2] N80-19745
OCEANOGRAPHY
A unique radio oceanographic radar
[AD-A077364] N80-19332
The evaluation of dull beam echo sounders in hydrographic surveying
[AD-A078273] N80-19747
OMNIDIRECTIONAL RADIO RANGES
A standard for RF modulation factor
[PB80-109085] N80-19319
ON-LINE PROGRAMMING
NLM online services reference manual
[PB80-114531] N80-19987
OPERATING SYSTEMS (COMPUTERS)
NSSC-2 operating system design requirements specification
[NASA-CR-161396] N80-19861
OPERATIONS RESEARCH
Estimating the time required to transition aircraft fleets to new scheduled maintenance intervals
[AD-A078808] N80-19027
Solar power satellite system definition study. Volume 3: Operations and systems synthesis, phase 2
[NASA-CR-160480] N80-19618
Performance measurement system: Recent systems development and applications
[HEDL-SA-1826-FP] N80-19924
Evaluation of operation and maintenance factors limiting biological wastewater treatment plant performance
[PB80-108947] N80-19993
OPERATORS (MATHEMATICS)
Dispersion, patterned and structured matrices: Vec operators and related topics N80-19914
Theory of edge detection
[AD-A078063] N80-19941
OPTICAL COMMUNICATION
Optical-communication systems for deep-space applications
[NASA-CR-162882] N80-19323
Strategic blue-green optical communications program plan. Investment strategy toward an optical solution for satellite-to-submarine information transfer
[AD-A078345] N80-19344
OPTICAL EQUIPMENT
Analytical studies of phase estimation techniques, volume 1
[AD-A078006] N80-19944
OPTICAL MEASURING INSTRUMENTS
The 6-beam test, for gamma densitometer
[LTR-141-122] N80-19477
OPTICAL MEMORY (DATA STORAGE)
Random access memories, volume 2. Citations from the Engineering Index data base
[PB80-802358] N80-19660
OPTICAL PROPERTIES
X-ray optical properties of a Wolter telescope
[NASA-TM-75811] N80-19994
OPTICAL PUMPING
Submillimeter wave spectroscopy and technology — optically-pumped laser spectroscopy
[AD-A078003] N80-19222
OPTICAL RADAR
The visiceilometer: A portable cloud height and visibility indicator
[AD-A078332] N80-19713
Lidar measurement of boundary layer winds and convective structure
[AD-A078590] N80-19719
OPTICAL WAVEGUIDES
Injection laser waveguide coupler
[AD-A077030] N80-19484

Forecast analysis of optical waveguide bus performance
[NASA-CR-162951] N80-19042
Optical channel waveguide arrays coupled to integrated charge-coupled devices and their applications
[AD-A077394] N80-19049

OPTIMAL CONTROL
Closed loop models for analyzing engineering requirements for simulators
[NASA-CR-2965] N80-19063
Sequential gradient-restoration algorithm for optimal control problems with general boundary conditions
N80-19067

OPTIMIZATION
GLOBALMIN: A computer program for global optimization
[AD-A079089] N80-19070
On optimization of query processing strategies
[AD-A079470] N80-19096

ORBIT CALCULATION
Geometry, artificial satellites, and orbit determination — use of solid state cameras to determine the orbits
[AD-A077049] N80-19177
Orbit attitude processor. STS-1 bench program verification test plan
[JSC-16096] N80-19179
Landsat MSS coordinate transformations — determining satellite orbits
[AD-A078418] N80-19506

ORBIT TRANSFER VEHICLES
Orbital Transfer Vehicle (OTV) advanced expander cycle engine point design study
[NASA-CR-161389] N80-19179

ORBITAL ASSEMBLY
Development of a composite geodetic structure for space construction, phase 1A
[NASA-CR-160598] N80-19144
Large Space Systems Technology, 1979 — antenna and space platform systems conference
[NASA-CP-2118] N80-19145
Construction alignment sensor feasibility demonstrations (laser measurement) N80-19148
Structural assembly in space N80-19150

ORBITAL MECHANICS
Geometry, artificial satellites, and orbit determination — use of solid state cameras to determine the orbits
[AD-A077049] N80-19177

ORBITAL VELOCITY
Trajectories optimization in hypersonic flight
[NASA-CR-162946] N80-19026

ORDNANCE
Delta-exact lower confidence bounds for series system reliability
[AD-A077524] N80-19023

ORGANIC WASTES (FUEL CONVERSION)
Environmental and economic evaluations of energy recovery from agricultural and forestry residues
[ANL/EES/TM-58] N80-19068

ORGANOMETALLIC COMPOUNDS
Small-molecule cyclic models for the synthesis of new polyphosphazenes side group construction via lithiophenoxy derivatives
[AD-A078183] N80-19192
Formation of organosilicon compounds. 58: Synthesis of a carbosilane with propellane structure
[RAE-LIB-TRANS-2029] N80-19265
Characterization and analysis of reactive organometallic polymers
[AD-A078184] N80-19270

ORTHOGONALITY
Application of a numerically generated orthogonal coordinate system to the solution of inviscid axisymmetric supersonic flow over blunt bodies
[NASA-TP-1619] N80-19031

OSCILLATING FLOW
Outline of research on oscillating boundary layers
[NASA-TM-75806] N80-19453

OSCILLOSCOPES
Pulse height analyzer/oscilloscope display interface
[DP-1534] N80-19478

OUTGASSING
Rapid laboratory method for testing outgassing of thermostable plastics and rubber N80-19706

OVENS
Thermocouple, multiple junction reference oven
[NASA-CASE-FRC-10112-1] N80-19469

OVER-THE-HORIZON RADAR
Development of HF skywave radar for remote sensing applications N80-19402
HF skywave radar estimates of the track, surface wind and waves of hurricane Anita N80-19403

OXIDATION
The oxidation of graphitic monolayers on Ni(110)
[AD-A079512] N80-19210

OXIDATION-REDUCTION REACTIONS
Experimental assessment of nitrogen oxides transformations while sampling combustion products
[AD-A079090] N80-19220
Development of a Fe-Pb(Ti) secondary battery system N80-19608

OXIDE FILMS
Formation of porous films on titanium alloys by anodization treatments
[AD-A077676] N80-19244

OXYGEN CONSUMPTION
Effect of hypoxia on oxygen transport properties of blood N80-19763

OXYGEN PRODUCTION
Chemically pumped iodine laser — based on the chemical production of oxygen
[AD-A078919] N80-19485

OXYGEN SPECTRA
Possibilities of using radiation in the oxygen absorption line at lambda = 2.53 mm on slant paths for thermal sounding of the atmosphere
[RLL-TRANS-1402-(9022.549)] N80-19681

P

P-N JUNCTIONS
Studies of silicon p-n junction solar cells
[NASA-CR-162832] N80-19609

PACIFIC OCEAN
Equatorial Pacific Ocean variability: Seasonal and El Nino times scales
[AD-A077031] N80-19724

PALLADIUM
Hydrogen entry and transport mechanisms in structural metals
[AD-A079812] N80-19248
Activation by means of colloidal palladium in the electroplating of ABS copolymers. 2: The nature of the palladium/tin (2) chloride activating solution
[BLL-RTS-11924] N80-19261

PANAVIA MILITARY AIRCRAFT
Reliability management of the avionic system of a military strike aircraft N80-19546

PARABOLIC REFLECTORS
Offset wrap rib concept and development
N80-19148

PARACHUTE DESCENT
Recovery system preliminary design. A simplified approach to determining staging, timing and altitude requirements for fast inflating parachutes
[AD-A077548] N80-19041

PARALLEL PROCESSING (COMPUTERS)
Design and analysis of interconnection networks for partitionable parallel processing systems
[AD-A079690] N80-19652
Log diameter restricted bottom-up triangle cellular acceptors UTCA's
[AD-A077526] N80-19672

PARAMETERIZATION
Parameter identification — conference on techniques applied to aircraft flight test data
[AGARD-LS-104] N80-19094
Aircraft parameter identification methods and their applications: Survey and future aspects
N80-19095
Identification evaluation methods N80-19096
Practical input signal design — For identifying stability and control derivatives N80-19097
Closed loop aspects of aircraft identification
N80-19104
Fast estimation of three parameters of Weibull law
N80-19526

PARTIAL DIFFERENTIAL EQUATIONS
Note on normalization of variables and and equations
[UCID-18083] N80-19908

PARTICLE INTERACTIONS
Field theory of pion-nucleus interactions
[DOE/ER-01388-775] N80-19931

PARTICLE MOTION
The theoretical treatment of particle swarms
[AD-A078218] N80-20000

PARTICLE SIZE DISTRIBUTION
Data reduction and analysis of graphite fiber release experiments
[NASA-CR-159032] N80-19048
Circus particle distribution study, part 5
[AD-A077361] N80-19741

PARTICLE TRAJECTORIES
The theoretical treatment of particle swarms
[AD-A078218] N80-20000

PARTICLES
Setting priorities for control of fugitive particulate emissions from open sources
[PB80-108962] N80-19674

PARTICULATE SAMPLING
An empirical approach for relating annual TSP concentrations to particulate microinventory emissions data and monitor siting characteristics
[PB80-113756] N80-19676

PASSAGEWAYS
Experimental results on the free propagation of UHF waves in tunnels N80-19409
Effects of tunnel and station size on the costs and service of subway transit systems
[UMTA-CA-06-0116-79-2] N80-19989
Low-cost bus-tunnels to the central business district
[UMTA-CA-06-0116-79-1] N80-19990

PASSENGER AIRCRAFT
Human comfort response to random motions with combined yawing and rolling motions
[NASA-CR-159187] N80-19602

PASSIVITY
Passive films, surface structure and stress corrosion and crevice corrosion susceptibility
[AD-A079596] N80-19243

PATTERN RECOGNITION
Texture extraction on the ILLIAC 4 — aerial images
[AD-A070523] N80-19471
Comparative study of anomalous gray-shade patterns in DMSP and LANDSAT imagery
[AD-A077902] N80-19595
AMORD: A deductive procedure system
[AD-A078417] N80-19891
Region representation: Quadtrees from boundary codes
[AD-A078350] N80-19892
The reduction of remote sensing data by visual means — education N80-20017

PATTERN REGISTRATION
Landsat MSS coordinate transformations — determining satellite orbits
[AD-A078418] N80-19506

PAVEMENTS
Nondestructive evaluation of airport pavements. Volume 2: Operational manual for PAVBEN program at TCC
[AD-A079495] N80-19130
Moisture movement and moisture equilibria in pavement systems
[PB80-120062] N80-19314
Evaluation and calibration of road meter devices for measuring pavement rideability
[PB80-110422] N80-19315

PDP 11 COMPUTER
Delta7: A computer model of Delta growth
[AD-A077053] N80-19892

PENNSYLVANIA
Installation guidelines for solar heating system, single-family residence at New Castle, Pennsylvania
[NASA-CR-161355] N80-19630

PERCEPTION
Constructions in geometry problem solving
[AD-A076339] N80-19904
Theory of constructions and set in problem solving
[AD-A076339] N80-19905

PERFORMANCE
Solar energy system performance evaluation: A seasonal report for SEMCO, Macon, Georgia
[NASA-CR-161380] N80-19629

PERFORMANCE PREDICTION
NADC ABC rotor maps
[AD-A078802] N80-19083
JPL analytical performance prediction capability — for antenna systems N80-19167

An efficient rotational nonequilibrium model of a cw chemical laser
[AD-A079485] N80-19487
Difficulties in predicting avionics reliability N80-19521
Micro-electronic systems reliability prediction N80-19524
Reliability improvement due to the application of clauses of operational reliability N80-19530
Methods used for discerning the reliability of military aircraft radar N80-19532
A JTIDS performance model for the E-3A N80-19535
Forecast analysis of optical waveguide bus performance
[NASA-CR-162851] N80-19942

PERFORMANCE TESTS
Solar energy system performance evaluation: Seasonal report for SEMCO, Lowshatchee, Florida
[NASA-CR-161379] N80-19627

PERIODIC VARIATIONS
On the role of the atmospheric zonal index cycle in solar/terrestrial coupling
[CONF-7906119-1] N80-19697

PERMEATING
Gas phase hydrogen permeation in alpha titanium and carbon steels
[NASA-CR-3190] N80-19236

PERMITTIVITY
An experimental study of surface wave propagation on a low permittivity medium N80-19353

PERSIAN GULF
Winter shamal in the Persian Gulf
[AD-A077727] N80-19720

PERSPIRATION
A device for determining the intensity of partial sweating
[NASA-TM-75429] N80-19801

PHASE DETECTORS
Critique of a Hughes shuttle Ku-band data sampler/bit synchronizer
[NASA-CR-160556] N80-19427

PHASE DIAGRAMS
The liquidus surface of the aluminum-titanium-boron phase diagram at the aluminum corner
[BLL-RTS-11695] N80-19235

PHASE LOCKED SYSTEMS
Analysis of first and second order binary quantized digital phase-locked loops for ideal and white Gaussian noise inputs
[NASA-CR-162854] N80-19056
Synchronization of the radio-4 (UK) transmitter chain on 200 kHz — examination of the means by which the carriers of three transmitters are phase locked
[BBC-RD-1979/27] N80-19317

PHASE TRANSFORMATIONS
Nonequilibrium phenomena in superconducting phase-slip centers
[AD-A078441] N80-19442

PHASED ARRAYS
Proceedings of the Antenna Applications Symposium
[AD-A077157] N80-19334

PHENOLOGY
Quantitative estimation of plant characteristics using spectral measurement: A survey of the literature
[E80-10078] N80-19987

PHOSPHORIC ACID
Contamination of the anode and cathode in phosphoric acid anodizing electrolytes
[AD-A077885] N80-19240

PHOSPHORUS
Non-point source - stream nutrient level relationships: A nationwide study. Supplement 1: Nutrient map reliability
[PB80-112691] N80-19679

PHOTOCHEMICAL OXIDANTS
User's guide to the ELSTAR photochemical air quality simulation model
[PB80-109184] N80-19675

PHOTOCHEMICAL REACTIONS
Photochemical transients of electrode bound methylene blue
[AD-A078908] N80-19218
Photochemistry and radiation chemistry of volatile silanes and germanes
[COO-3416-13] N80-19229

PHOTOCONDUCTIVITY
Conduction in polydiacetylene bilayers
[AD-A078755] N80-19279

PHOTODETACHMENT
Photodissociation and photodetachment of atmospheric negative ions
[AD-A079091] N80-19224

PHOTODISSOCIATION
Photodissociation and photodetachment of atmospheric negative ions
[AD-A079091] N80-19224
Dissociative and double photoionization of CO2 from threshold to 90 A
[NASA-CR-162844] N80-19929

PHOTOELASTICITY
Contribution of photoelastic analysis to the study of turbo-engine components
[BR71965] N80-19112

PHOTOELECTRIC EMISSION
Determination of morphology and electronic structure in solids with 20-1000 eV radiation — techniques of photon absorption and photoemission for spectroscopic analysis of materials
[LBL-9482] N80-19971
Determinations of electronic states in crystalline semiconductors and metals by angle-resolved photoemission
[LBL-9429] N80-19972

PHOTOGEOLOGY
Video processing of remote sensor data applied to uranium exploration in Wyoming
[GJBX-171(79)] N80-19603

PHOTOGRAMMETRY
Conference of Remote Sensing Educators (CORSE-78)
[NASA-CP-2102] N80-20003
The reduction of remote sensing data by visual means — education N80-20017

PHOTOGRAPHIC RECORDING
Surface Acoustic Waves: Experimental device fabrication
[BBC-RD-1979/29] N80-19929

PHOTOINTERPRETATION
Opportunities and problems in introducing or expanding the teaching of remote sensing in universities N80-20011
The use of multimedia and programmed teaching machines for remote sensing education N80-20012
Textbooks and technical references for remote sensing N80-20014
The reduction of remote sensing data by visual means — education N80-20017

PHOTOIONIZATION
Dissociative and double photoionization of CO2 from threshold to 90 A
[NASA-CR-162844] N80-19929

PHOTOMAPPING
Color ink-jet demonstration program
[AD-A075377] N80-19476

PHOTOMETRY
Photometry of artificial satellites application to the Ground Electro-Optical Deep Space Surveillance (GEODSS) program
[AD-A078675] N80-19178
An application of the photometric stereo method
[AD-A078125] N80-19470

PHOTOVOLTAIC CELLS
LSA field test
[NASA-CR-162798] N80-19611
Develop silicone encapsulation systems for terrestrial silicon solar arrays
[NASA-CR-162840] N80-19617
Glass for low-cost photovoltaic solar arrays
[NASA-CR-162865] N80-19633
On influencing the operating temperatures of Motorola and Arco solar photovoltaic modules
[COO-4094-59] N80-19649
Cadmium sulfide solar cells, volume 1. Citations from the NTIS data base
[PB80-802218] N80-19656

PHTHALOCYANIN
Highly conducting iodinated fluoroaluminum and fluorogallium phthalocyanine polymers
[AD-A078188] N80-19273

PHYSICAL CHEMISTRY
The chemistry of sulfur in char and the implications for hydrogasification/hydrodesulfurization
[FE-2449-9] N80-19298

PHYSICAL EXERCISE
Effect of graded physical load on the state of the liver from morphometric data and biochemical blood indices of rats against a background of hypokinesia
[NASA-TM-75969] N80-19750
Dynamics of erythrocyte count, hemoglobin, and catalase activity in rat blood in hypokinesia, muscular activity and restoration
[NASA-TM-75058] N80-19752

PHYSICAL SCIENCES
Journal of Research of the National Bureau of Standards, volume 84, no. 5 — results of research in physical and engineering sciences with emphasis on measurement and standardization
[PB80-103674] N80-20022

PHYSIOCHEMISTRY
Study of the electronic surface state of 3-5 compounds — physics and chemistry of indium phosphates, gallium arsenides, and gallium antimonides
[AD-A078304] N80-19989

PHYSIOLOGICAL EFFECTS
Effect of habituation on the susceptibility of the rat to restraint ulcers
[NASA-TM-76072] N80-19748
Effect of graded physical load on the state of the liver from morphometric data and biochemical blood indices of rats against a background of hypokinesia
[NASA-TM-75969] N80-19750
Effectiveness of using thyrocalcitonin for the prevention of a calcium metabolic disorder in the mineralized tissues of rabbits with 30 days hypokinesia
[NASA-TM-75987] N80-19751
Dynamics of erythrocyte count, hemoglobin, and catalase activity in rat blood in hypokinesia, muscular activity and restoration
[NASA-TM-76058] N80-19752
State of the mineral component of rat bone tissue during hypokinesia and the recovery period
[NASA-TM-76059] N80-19753
Reaction of chickens to graduated length of exposure to stress
[NASA-TM-76071] N80-19754
USSR report: Space biology and aerospace medicine, v. 14, no.1
[JPRS-75251] N80-19755
Effects of unusual schedules of daily activity and sleep deprivation on man's functional state and work fitness N80-19756
Effect of hyperoxia on oxygen transport properties of blood N80-19783
External respiration and acid-base balance of human blood during long-term antiorthostatic hypokinesia and in the recovery period N80-19784
Distinctions in development of pyrogenal fever in animals following prolonged hypokinesia N80-19785
Alimentary hypokinesia
[NASA-TM-75989] N80-19794
Metabolism during hypodynamia
[NASA-TM-75996] N80-19795
Blood circulation under conditions of weightlessness
[NASA-TM-76036] N80-19796
Effects of artillery noise on the hearing of protected crew personnel
[AD-A079864] N80-19805

PHYSIOLOGICAL RESPONSES
Effects of long-term space flights on reactions of adrenal cortex and medulla N80-19759

PICKLING (METALLURGY)
ISS-SIMS surface characterization of smut on stainless steel
[AD-A078122] N80-19238

PICOSECOND PULSES
Picosecond laser studies of aromatic radical ions
[AD-A078721] N80-19219

PIEZOELECTRIC CRYSTALS
The crystallization thermodynamics of piezoelectric copolymers
[AD-A078705] N80-19278

PIEZOELECTRIC TRANSDUCERS
Ultrasonic Doppler directional blood flow velocity meter
[RAE-LIB-TRANS-1918] N80-19780

PILOT PERFORMANCE
Aircraft emergency decisions: Cognitive and situational variables
[AD-A077413] N80-19051
Stress factors on pilot performance. A bibliography with abstracts
[PB80-803075] N80-19794
Modeling the human operator: Applications to system cost effectiveness N80-19848

PILOT PLANTS
Environmental assessment of the HYGAS process. Volume 1: HYGAS environmental characterization, data synthesis, analysis, and interpretation, tests 37 - 64
[FE-2433-85-VOL-1] N80-19305
Synthesis gas demonstration plant program, phase 1
[FE-2537-06] N80-19306

PILOT TRAINING
Aircraft emergency decisions: Cognitive and situational variables
[AD-A077413] N80-19051
Aviation training using video disk technology N80-19828

PIONS
Field theory of pion-nucleus interactions
[DOE/ER-01388-77S] N80-19831
Experiments on the nuclear interactions of pions
[ORO-4043-39] N80-19932

PIPELINES
Use of remote sensing for land use policy formulation — Kalamazoo, Lake, Mecosta, Newaygo, Osceola, and Wexford counties, Michigan
[E80-10085] N80-19592

PIPES (TUBES)
Tubing for augmented heat transfer
[GA-A-15442] N80-19482

PISTON ENGINES
A 15 kWe (nominal) solar thermal-electric power conversion concept definition study: Steam Rankin reciprocator system
[NASA-CR-159591] N80-19612

PISTONS
Experimental investigation into the heat flux in the piston and cylinder liner of a high-speed diesel engine
[BLL-RTS-11902] N80-19494

PLANTS (BOTANY)
LANDSAT digital analysis of the initial recovery of the Kokolik River tundra fire area, Alaska
[E80-10080] N80-19588

PLASMA CONTROL
Confinement and heating of hot plasmas in a hybrid system of Tokamak and stellarator
[ISSN-0547-1567] N80-19953
Magnetic mirror confinement of high-energy, high-density plasma
[UCRL-82790] N80-19959

PLASMA CORE REACTORS
Argon/UF6 plasma experiments: UF6 regeneration and product analysis
[NASA-CR-3258] N80-19935

PLASMA DENSITY
Spacecraft charging model: Two Maxwellian approximation
[AD-A077907] N80-19174

PLASMA DIAGNOSTICS
Characteristics of the background emission spectrum from a miniature ICP
[AD-A077876] N80-19955

PLASMA HEATING
Confinement and heating of hot plasmas in a hybrid system of Tokamak and stellarator
[ISSN-0547-1567] N80-19953
Theory of electron cyclotron resonance heating of Tokamak plasmas
[AD-A075362] N80-19957

PLASMA INTERACTIONS
Evaluation of classical vaporization and ionization interferences in a miniature ICP
[AD-A077886] N80-19225

PLASMA JETS
Evaluation of classical vaporization and ionization interferences in a miniature ICP
[AD-A077886] N80-19225
Langmuir probe measurements of double-layers in a pulsed discharge
[NASA-CR-162845] N80-19954

PLASMA LAYERS
Langmuir probe measurements of double-layers in a pulsed discharge
[NASA-CR-162845] N80-19954

PLASMA SHEATHS
Magnetosheath effects on cylindrical Langmuir probes
[NASA-CR-162852] N80-19958

PLASMA SPRAYING
In vivo and in vitro aging of plasma-sprayed alumina on 316L stainless steel and TiEAL-4V ELI substrates — prosthetic devices N80-19231

PLASMA WAVES
Nonlinear wave evolution in VLASOV plasma: A lie-transform analysis
[LBL-8185] N80-19992

PLASMAS (PHYSICS)
Transequatorial propagation through equatorial plasma bubbles: Discrete events N80-19393
Ionospheric-Magnetospheric Plasma Experiment (IMPE)
[AD-A078082] N80-19687
Theory of the resistive hose instability in relativistic electron beams — magnetohydrodynamic instability of a relativistic electron beam propagating in a preionized plasma
[AD-A078188] N80-19936
Interplanetary medium data book, supplement, 1975 - 1978
[NASA-TM-80759] N80-19997

PLASTIC FLOW
Hydrogen effects on flow localization and fracture in type 304L stainless steel
[DP-MS-79-57] N80-19256

PLASTICS
Rapid laboratory method for testing outgassing of thermostable plastics and rubber N80-19766

PLATES (STRUCTURAL MEMBERS)
Prediction of the structural damping of a vibrating stiffened plate N80-19574

PLATINUM
Optimization of Pt-doped Kocite (trade name) electrodes in H3Po4 fuel cells
[AD-A075372] N80-19639

PLUGS
High temperature penetrator assembly with bayonet plug and ramp-activated lock
[NASA-CASE-MSC-18526-1] N80-19488

POINT SPREAD FUNCTIONS
Analysis of NOAA-MSFC GOES X-ray telescope
[NASA-CR-161397] N80-19595

POLAR REGIONS
Characteristics of the high latitude ionosphere produced by auroral particle precipitation N80-19389
Perspective on the prediction of auroral absorption N80-19390

POLARIZATION (WAVES)
Calculation of the relationship between attenuation and intensity of precipitation for various polarizations
[NASA-TM-75779] N80-19705

POLLUTION CONTROL
Pollutants from synthetic fuels production: Sampling and analysis methods for coal gasification
[PB80-104656] N80-19309
Application of coke plant control technologies to coal conversion
[PB80-108954] N80-19310
Setting priorities for control of fugitive particulate emissions from open sources
[PB80-108962] N80-19674
Engineering evaluation of control technology for H-Coal and Exxon donor solvent processes
[PB80-108566] N80-19678

POLLUTION MONITORING
Automated syringe sampler
[NASA-CASE-LAR-12308-1] N80-19664
Mobile source NOx monitor, hydrogen-atom direct chemiluminescence method
[PB80-102759] N80-19670
Development of an emission inventory quality assurance program
[PB80-112345] N80-19673
An empirical approach for relating annual TSP concentrations to particulate microinventory emissions data and monitor siting characteristics
[PB80-113756] N80-19676

POLYBUTADIENE
Effect of number of chemical bonds on the strength of adhesion between glass and polybutadiene
[AD-A078237] N80-19274

POLYETHYLENES
Comparison of crystallinity and molecular orientation between surface and bulk of some polymers by FTIR-ATR and transmission spectroscopy — polyethylene and polypropylene
[AD-A078243] N80-19269

POLYIMIDES
Quality control developments for graphite/PMR15 polyimide composites materials
[NASA-CR-159182] N80-19206
Comparison of the tribological properties at 25 C of seven different polyimide films bonded to 301 stainless steel
[NASA-TM-81413] N80-19263

POLYMER CHEMISTRY
Small-molecule cyclic models for the synthesis of new polyphosphazenes side group construction via lithiophenoxy derivatives
[AD-A078183] N80-19192

POLYMER MATRIX COMPOSITE MATERIALS
Quality control developments for graphite/PMR15 polyimide composites materials
[NASA-CR-159182] N80-19206

POLYMERIC FILMS
Comparison of the tribological properties at 25 C of seven different polyimide films bonded to 301 stainless steel
[NASA-TM-81413] N80-19263
Figure-of-merit for bare and coated wires and flat ribbon jumpers
[BDX-613-2304] N80-19445

POLYMERIZATION
Small-molecule cyclic models for the synthesis of new polyphosphazenes side group construction via lithiophenoxy derivatives
[AD-A078183] N80-19192
Ways to inorganic polymers
[BLL-RTS-11905] N80-19262

POLYMERS
Characterization and analysis of reactive organometallic polymers
[AD-A078184] N80-19270
Viscoelastic polymer for printed-circuit-board vibration damping
[AD-A077803] N80-19275
Conduction in polydiacetylene bilayers
[AD-A078755] N80-19279
Development of surface interactions at polymer-metal interfaces
[AD-A077276] N80-19280
The effect of seawater on polymers
[AD-A077324] N80-19281

POLYPROPYLENE
Comparison of crystallinity and molecular orientation between surface and bulk of some polymers by FTIR-ATR and transmission spectroscopy — polyethylene and polypropylene
[AD-A078243] N80-19269

POLYSTYRENE
Evaluation of a polyurethane/polystyrene composite cushioning material
[AD-A077918] N80-19271

POLYURETHANE RESINS
Evaluation of a polyurethane/polystyrene composite cushioning material
[AD-A077918] N80-19271
Surface chemical composition - depth profile of polyether polyurethaneureas as studied by FT-IR and ESCA
[AD-A078240] N80-19272

POROSITY
Steady-wave analysis of the effect of porosity on viscous and inviscid detonations by use of a reactive-porous analog
[LA-7819] N80-19463

PORTABLE EQUIPMENT
Project FIRES - Firefighters Integrated Response Equipment System. Volume 1: Program overview and summary, phase 1A
[NASA-CR-161399] N80-19795
Project FIRES - Firefighters Integrated Response Equipment System. Volume 2: Protective ensemble performance standards goals for firefighter protection, phase 1A
[NASA-CR-161400] N80-19796
Project FIRES - Firefighters Integrated Response Equipment System. Volume 3: Test and evaluation report, phase 1A
[NASA-CR-161401] N80-19797
Project FIRES - Firefighters Integrated Response Equipment System. Volume 4: Technology demonstration ensemble, phase 1A
[NASA-CR-161402] N80-19798

Project FIRES - Firefighters Integrated Response Equipment System. Volume 5: Prototype protective ensemble data package, phase 1A
[NASA-CR-161403] N80-19799

POSITION (LOCATION)
A mobile HF impulse source locator — thunderstorm location and tracking N80-19414

POSITION INDICATORS
Application of Loran-C positioning to hydrographic surveying
[AD-A078278] N80-19057
Use of laser interferometer for position feedback
[Y-2188] N80-19489

POSITIONING DEVICES (MACHINERY)
Solar-powered sun tracker
[AD-A078653] N80-19640

POSITRONS
Testing quantum chromodynamics in electron-positron annihilation at high energies
[DOE/ER-01388-777] N80-19938

POTABLE WATER
Water quality monitor — spacecraft potable water
[NASA-CR-160412] N80-19663

POWDER (PARTICLES)
Sintering of beta silicon nitride solid solutions containing metal oxide
[AD-A077415] N80-19209

POWDER METALLURGY
Consolidation of titanium powder to near net shapes
[AD-A078039] N80-19239
Powder metallurgy of aluminum. Citations from the NTIS data base
[PB80-803216] N80-19259
Powder metallurgy of aluminum. Citations from the Engineering Index data base
[PB80-803224] N80-19260

POWER CONDITIONING
Studies of silicon p-n junction solar cells
[NASA-CR-162832] N80-19609

POWER EFFICIENCY
On influencing the operating temperatures of Motorola and Arco solar photovoltaic modules
[COO-4094-59] N80-19649

POWER LINES
Large space systems technology electronics: Data and power distribution N80-19168

POWER SERIES
Power series for the calculation of Bessel functions for large arguments, provides J sub nu (x) and y sub nu (x), accurate to at least 14 places
[AD-A077899] N80-19898

POWER SPECTRA
An efficient rotational nonequilibrium model of a cw chemical laser
[AD-A078485] N80-19487

POWERED LIFT AIRCRAFT
Analysis of fuel-conservative curved decelerating approach trajectories for powered-lift and CTOL jet aircraft
[NASA-TP-1650] N80-19022
Flight evaluation of configuration management system concepts during transition to the landing approach for a powered-lift STOL aircraft
[NASA-TM-81146] N80-19127

PREAMPLIFIERS
Monolithic microwave preamplifier
[AD-A078522] N80-19441

PRECIPITATION (METEOROLOGY)
SMMR simulator radiative transfer calibration model. 1: Derivation
[E80-10081] N80-19589
Remote sensing applications to resource problems in South Dakota — Chamberlain, Rapid City, Watertown; Spink County; Lake Herman and Six-Mile Creek Watersheds; and Missouri River watertowl
[E80-10086] N80-19593
Calculation of the relationship between attenuation and intensity of precipitation for various polarizations
[NASA-TM-75779] N80-19705
Rain attenuation over Earth-satellite paths
[AD-A075390] N80-19715

PREDICTION ANALYSIS TECHNIQUES
Undercarriage drag prediction methods
[ESDU-79015] N80-19028
Application of the Estimation-Before-Modeling (EBM) system identification method to the high angle of attack/sideslip flight of the T-2C jet trainer aircraft. Volume 2: Simulation study using T-2C wind tunnel model data
[AD-A078823] N80-19061
Application of the Estimation-Before-Modeling (EBM) system identification method to the high angle of attack/sideslip flight of the T-2C jet trainer aircraft. Volume 3: Identification of T-2C aerodynamics stability and control characteristics from actual flight test data
[AD-A078824] N80-19072
Advanced infrared signature prediction program. Spectral calculation of radiation from a turbine propulsion system as intercepted by an observer (SCORPION). Volume 2: Analysis
[AD-A078436] N80-19124
Avionics Reliability, Its Techniques and Related Disciplines — conferences
[AGARD-CP-261] N80-19519
Micro-electronic systems reliability prediction N80-19524
Prediction of the structural damping of a vibrating stiffened plate N80-19574

PREDICTIONS
A sporadic E prediction technique N80-19397
A new approach to maintainability prediction — avionics, ground, and shipboard electronics N80-19537

PREFLIGHT OPERATIONS
Large space system control technology model order reduction study N80-19164

PREMIXED FLAMES
Turbulence, combustion, pollutant, and stability characterization of a premixed, step combustor
[NASA-CR-3230] N80-19108

PRESSURE GAGES
Development of passive high pressure gauges: Field experiment
[AD-A077194] N80-19474

PRESSURE MEASUREMENTS
Development of passive high pressure gauges: Field experiment
[AD-A077194] N80-19474

PRINTED CIRCUITS
Viscoelastic polymer for printed-circuit-board vibration damping
[AD-A077803] N80-19275

PROBABILITY DISTRIBUTION FUNCTIONS
Development of a normalized probability distribution for lateral load factors due to aircraft ground turning
[AD-A077047] N80-19070
Prediction intervals for first order Markov processes
[AD-A078283] N80-19918

PROBABILITY THEORY
An approach for providing more accurate probability assessments
[AD-A077994] N80-19979

PROBLEM SOLVING
Sequential gradient-restoration algorithm for optimal control problems with general boundary conditions N80-19587
AMORD: A deductive procedure system
[AD-A078417] N80-19891
Design and implementation of a new descent algorithm for local optimization
[AD-A078220] N80-19896
Fast algorithms for solving Toeplitz system of equations and finding Rational Hermite Interpolants
[AD-A075376] N80-19901
Constructions in geometry problem solving
[AD-A076336] N80-19904
Theory of constructions and set in problem solving
[AD-A076339] N80-19905
One-sided continuous dependence of maximal solutions — Caratheodory condition
[AD-A079722] N80-19906
An approach for providing more accurate probability assessments
[AD-A077994] N80-19979

PROCESS CONTROL (INDUSTRY)
Engineering evaluation of control technology for H-Coal and Exxon donor solvent processes
[PB80-108566] N80-19678

PROCUREMENT
The integrated management of reliability and maintainability in procurement N80-19558

PROCUREMENT MANAGEMENT
Life sciences flight experiments program, life sciences project division, procurement quality provisions
[NASA-TM-80962] N80-19515
Evaluation of and recommended change to the Reliability Improvement Warranty (RIW) guidelines
[AD-A077672] N80-19518
Competition in the acquistion of major weapons systems
[AD-A078268] N80-19991

PRODUCT DEVELOPMENT
Low cost point focus solar concentrator, phase 1
[NASA-CR-162848] N80-19624

PRODUCTION ENGINEERING
Slicing of silicon into sheet material. Silicon sheet growth development for the large area silicon sheet task of the low cost solar array project
[NASA-CR-162828] N80-19623
General methods to enable robots with vision to acquire, orient and transport workpieces
[PB80-106388] N80-19808

PRODUCTION MANAGEMENT
Production Reliability Assurance (PRA): Testing N80-19531

PRODUCTS
Effects of carbon fibers on consumer products N80-19204

PROFILOMETERS
A laser profilometer for digital terrain mapping N80-19369

PROGRAM VERIFICATION (COMPUTERS)
Analytical software verification N80-19552
Verification and validation of avionic simulations N80-19814
Software engineering principles
[AD-A078005] N80-19888
Metrics of software quality
[AD-A077896] N80-19889
Methodologies for computer program testing
[AD-A077414] N80-19976

PROGRAMMED INSTRUCTION
The use of multimedia and programmed teaching machines for remote sensing education N80-20012

PROGRAMMING LANGUAGES
An introduction to the selection and use of simulation languages N80-19810
A formal definition of AMDL
[AD-A078035] N80-19867
Software engineering principles
[AD-A078005] N80-19868
Log diameter restricted bottom-up triangle cellular acceptors UTCA's
[AD-A077526] N80-19872
JOYCE: A language for computer networks
[AD-A078706] N80-19879

PROJECT MANAGEMENT
The reliability improvement warranty and its application to the F-18 multinational fighter program N80-19561
Federal weather modification efforts need congressional attention
[PB80-106511] N80-19742

PROJECT PLANNING
Advanced materials for space N80-19172

PROJECTILES
Crystal-controlled projectile telemetry transmitter
[AD-A078214] N80-19180

PROPAGATION MODES
Modes of dielectric waveguides of arbitrary cross-sectional shape
[AD-A077032] N80-19337
Terrain profiles and contours in electromagnetic wave propagation
[AGARD-CP-269] N80-19345
High-frequency signal propagation and scattering in guiding channels N80-19351
Hybrid ray-mode formulation of tropospheric propagation N80-19382
Scatter injection/ducted mode HF radar N80-19398
Excitation of the HF surface wave by vertical and horizontal apertures N80-19410
Mode conversion by tunnel non-uniformities in leaky feeder communication systems N80-19413

PROPELLANT EVAPORATION
Evaporation and dispersion of hazardous materials
[AD-A077399] N80-19291

PROPELLANT PROPERTIES
Fourier Transform Infrared Spectroscopy (FTIS). Volume 1: Technical Report — service life of solid rocket propellants
[AD-A078996] N80-19227
Fourier Transform Infrared Spectroscopy (FTIS). Volume 2: User's manual
[AD-A078997] N80-19228
PROPELLANT TANKS
Hydroelastic vibration analysis of partially liquid-filled shells using a series representation of the liquid
[NASA-TP-1558] N80-19583
PROPELLANTS
Two dimensional convective flamespreading in packed beds of granular propellant — using digital simulation
[AD-A075326] N80-19295
PROPELLER EFFICIENCY
Aeroacoustic wind-tunnel tests of a light twin-boom general-aviation airplane with free or shrouded-pusher propellers — in the Langley full-scale tunnel
[NASA-TM-80253] N80-19023
PROPULSION SYSTEM CONFIGURATIONS
Orbital Transfer Vehicle (OTV) advanced expander cycle engine point design study
[NASA-CR-161389] N80-19179
PROPULSION SYSTEM PERFORMANCE
Preliminary study of VTO thrust requirements for a V/STOL aircraft with lift plus lift/cruise propulsion
[NASA-TM-81429] N80-19110
PROPYL NITRATE
Mechanistic studies of the effect of lead salts on double base propellant combustion. The use of model systems — effects of lead oxides on pyrolysis of propyl nitrates
[AD-A075371] N80-19296
PROSTHETIC DEVICES
In vivo and in vitro aging of plasma-sprayed alumina on 316L stainless steel and Ti6Al-4V ELI substrates — prosthetic devices
N80-19221
PROTECTION
Rocket motor blast effects and proposed ablative protection for RAM launching system EX 43
[AD-A077037] N80-19190
Lightweight pilot helmets: The issue of weight versus protection
[AD-A078325] N80-19606
PROTECTIVE CLOTHING
Project FIRES - Firefighters Integrated Response Equipment System. Volume 1: Program overview and summary, phase 1A
[NASA-CR-161399] N80-19795
Project FIRES - Firefighters Integrated Response Equipment System. Volume 2: Protective ensemble performance standards goals for firefighter protection, phase 1A
[NASA-CR-161400] N80-19796
Project FIRES - Firefighters Integrated Response Equipment System. Volume 3: Test and evaluation report, phase 1A
[NASA-CR-161401] N80-19797
Project FIRES - Firefighters Integrated Response Equipment System. Volume 4: Technology demonstration ensemble, phase 1A
[NASA-CR-161402] N80-19798
Project FIRES - Firefighters Integrated Response Equipment System. Volume 5: Prototype protective ensemble data package, phase 1A
[NASA-CR-161403] N80-19799
PROTEINS
Effects of flights differing in duration on protein composition of cosmonauts blood
N80-19757
A continuum model of protein transport across the endothelium in the lungs and in the body of humans
N80-19778
PROTON SCATTERING
The elastic and inelastic scattering of 0.8 GeV protons by Y-89 and Zr-90
N80-19804
PROTONS
Effects of 25 and 50 MeV protons on human peripheral blood lymphocyte chromosones in vitro
N80-19767
PSYCHOACOUSTICS
Methods of sound simulation and applications in flight simulators
[NASA-TM-75768] N80-19133
PSYCHOPHYSICS
Development of a visual inspection technique (optical assessment of aircraft transparencies)
[AD-A079369] N80-19086
PSYCHOPHYSIOLOGY
Biofeedback: A bibliography with abstracts
[PB80-803117] N80-19790
PULSARS
On the continuing stellar formation in the central regions of some globular clusters and their relation to the pulsars
[NASA-TM-75703] N80-19998
PULSE AMPLITUDE
Pulse height analyzer/oscilloscope display interface
[DP-1534] N80-19478
PULSE COMMUNICATION
Channel measurement for wideband digital communication over fading channels N80-19316
The role of HF in air-ground communications: An overview N80-19373
PULSE DOPPLER RADAR
Range vernier
[AD-A077178] N80-19335
PULSED LASERS
JPL self pulsed laser surface measurement system development — large space deployed antenna structures N80-19149
Experimental pulsed laser remote crosswind measurement system. Feasibility study and design, part 5
[AD-A077831] N80-19721
PULSED RADIATION
A computer program for ELF/VLF pulse propagation in a laterally homogeneous Earth-ionosphere waveguide
[AD-A076306] N80-19341
Langmuir probe measurements of double-layers in a pulsed discharge
[NASA-CR-162845] N80-19954
PUMPS
Solar powered liquid piston Stirling cycle irrigation pump
[SAN/1894-1] N80-19841
PYRIDINES
Electrochemistry of solutes in chloroaluminate melts and the development of related electrochemical methodology
[AD-A078242] N80-19223
PYROLYSIS
Glass shell manufacturing in space — residual gases in spherical shells made from metal-organic gels
[NASA-CR-161408] N80-19141
Mechanistic studies of the effect of lead salts on double base propellant combustion. The use of model systems — effects of lead oxides on pyrolysis of propyl nitrates
[AD-A075371] N80-19296
Systems studies of coal conversion processes using a reference simulator
[FE-2275-11] N80-19307
Analysis of thermal decomposition products of flue gas conditioning agents
[PB80-111618] N80-19672
PYROTECHNICS
Harpoon pyrotechnic shock study
[AD-A078727] N80-19175
PYRUVATES
Effect of hypoxia and hypercapnia on lactate and pyruvate levels in rat blood and myocardium
N80-19775

Q

QUADRUPOLES
An RF oscillator for rocket-borne and balloon-borne quadrupole mass spectrometers
[AD-A078797] N80-19473
QUALITY CONTROL
Quality control developments for graphite/PMR15 polyimide composites materials
[NASA-CR-159182] N80-19206
Life sciences flight experiments program, life sciences project division, procurement quality provisions
[NASA-TM-80662] N80-19515
Reliability improvement warranty: An overview
N80-19527
Reliability clauses in contracts N80-19528
The increase of the reliability of electronic equipment subject to reliability clauses N80-19529
Reliability improvement due to the application of clauses of operational reliability N80-19530
Production Reliability Assurance (PRA): Testing
N80-19531
Software quality and its assurance N80-19553
Development of an emission inventory quality assurance program
[PB80-112345] N80-19573
QUANTITATIVE ANALYSIS
Characterization and analysis of reactive organometallic polymers
[AD-A078184] N80-19270
QUANTUM CHROMODYNAMICS
Testing quantum chromodynamics in electron-positron annihilation at high energies
[DOE/ER-01389-777] N80-19908
QUEUEING THEORY
Performance collapse due to overhead in a simple, single-server queueing system
[AD-A078190] N80-19888
QUINOLINE
Kinetics and mechanism of desulfurization and denitrogenation of coal-derived liquids — quioline, indole, dibenzothiophene, and naphthalene
[FE-2028-15] N80-19252

R

RADAR
Ground-wave and sky-wave sea-state sensing experiments in the United Kingdom N80-19400
RADAR ANTENNAS
Proceedings of the Antenna Applications Symposium
[AD-A077187] N80-19334
RADAR APPROACH CONTROL
Airborne radar approach system flight test experiment
[AD-A077900] N80-19054
RADAR BEAMS
Contributions to signal processing for the helio program
[AD-A078217] N80-19326
Azimuth beamwidth effect on radar sensed terrain horizon profiles N80-19362
RADAR DETECTION
Ku-band radar threshold analysis
[NASA-CR-160557] N80-19322
Prediction of radar coverage against very low altitude aircraft N80-19364
RADAR ECHOES
Experimental measurements of ground reflection elevation multipath characteristics and its effects on a small aperture elevation tracking radar
[AD-A077915] N80-19327
RADAR EQUIPMENT
Methods used for discerning the reliability of military aircraft radar N80-19532
RADAR IMAGERY
A system for using radar to record wave direction
[AD-A078307] N80-19342
Multisensor analysis of hydrologic features in the Wind River Range, Wyoming with emphasis on the SEASAT SAR
[E80-10063] N80-19591
RADAR MEASUREMENT
Ocean swell parameters from narrow-beam HF radar sea echo N80-19404
RADAR RANGE
Scatter injection/ducted mode HF radar
N80-19396
RADAR SCATTERING
The RADOT code system to calculate the radar return from a forested area
[AD-A078471] N80-19333
RADAR SIGNATURES
Ground-wave and sky-wave sea-state sensing experiments in the United Kingdom N80-19400
Sea-state directional spectra observed by HF Doppler radar N80-19401
An investigation of radar returns and their relationship to severe weather occurrences — the use of meteorological radar and radar signatures to predict thunderstorms
[AD-A078858] N80-19714
RADAR TRACKING
Tropospheric refractive studies for SPADATS radar sites
[AD-A077024] N80-19338
Development of HF skywave radar for remote sensing applications N80-19402

Application of computer simulations to development of NATO E-3A automatic track initiation algorithms N80-19827

RADAR TRANSMISSION
Prediction of radar coverage against very low altitude aircraft N80-19364
Scatter injection/ducted mode HF radar N80-19398

RADIANT FLUX DENSITY
Visible flux variations across finite clouds — satellite images N80-19699

RADIATION ABSORPTION
A theory of anomalous absorption, backscatter and flux limitation in laser produced plasmas [AD-A075350] N80-19956

RADIATION CHEMISTRY
Photochemistry and radiation chemistry of volatile silanes and germanes [COO-3416-13] N80-19229

RADIATION DISTRIBUTION
Scattered radiation fields from rough surfaces full wave solutions N80-19356
Theoretical aspects of transient radiation and scattering in lossless two medium half spaces N80-19357

RADIATION EFFECTS
Effects of 25 and 50 MeV protons on human peripheral blood lymphocyte chromosones in vitro N80-19767
Study of radioprotective effect of high-intensity magnetic fields on mammalian cell cultures N80-19776

RADIATIVE TRANSFER
SMMR simulator radiative transfer calibration model. 1: Derivation [E80-10081] N80-19589

RADIO ALTIMETERS
A unique radio oceanographic radar [AD-A077364] N80-19332
Radar altimeter measurements N80-19368

RADIO COMMUNICATION
Theoretical distribution functions of multipath propagation and their parameters for mobile radio communication in quasi-smooth terrain N80-19358
Special topics in HF propagation [AGARD-CP-263] N80-19372
The role of HF in air-ground communications: An overview N80-19373
HF communication to small low flying aircraft N80-19374
Real-time adaptive HF frequency management N80-19376
Assessment of HF communications reliability N80-19377
Augmentation of HF propagation — using chemical ion clouds N80-19379
Perspective on the prediction of auroral absorption N80-19390
Principles of HF communication in tunnels using open transmission lines and leaky cables N80-19405
New technology to improve HF circuit reliability and availability for remote regions N80-19417

RADIO DIRECTION FINDERS
A new computer-controlled High Frequency direction-finding and transmitter locating system N80-19415

RADIO EQUIPMENT
Standard engineering installation package. Air Traffic Radio Channel Control (ATRCC) equipment [AD-A077648] N80-19059

RADIO FREQUENCY INTERFERENCE
Adjacent-signal characteristics and co-channel interference of a land mobile lincompex system in the VHF band [BLL-RTS-11914] N80-19318
Acoustooptic spectrum analysis and narrowband interference excision in wideband signal environments [AD-A078286] N80-19325
The effects of re-radiation from high-rise buildings and transmission lines upon the radiation pattern of MF broadcasting antenna arrays N80-19347

RADIO NAVIGATION
New possibilities offered by a radio-inertial hybrid guidance system digital simulation study N80-19636

RADIO RECEIVERS
HF wavefront irregularities observed on a large aperture receiving array N80-19396
Military adaption of a commercial VOR/ILS airborne radio with a reliability improvement warranty N80-19540

RADIO RELAY SYSTEMS
Radio network and radio link surveys derived by computer from a terrain data base N80-19365

RADIO SIGNALS
Comparison of measured and predicted MUF's at a remote location — high frequency radio transmitters N80-19378

RADIO TELEMETRY
Crystal-controlled projectile telemetry transmitter [AD-A078214] N80-19180

RADIO TRANSMISSION
Modern HF communications for low flying aircraft N80-19375
The influence of ionospheric models on calculations of decametric wave propagation N80-19383
On determining the Maximum Usable Frequency (MUF) N80-19388
Experimental results on the free propagation of UHF waves in tunnels N80-19409

RADIO TRANSMITTERS
Crystal-controlled projectile telemetry transmitter [AD-A078214] N80-19180
Synchronization of the radio-4 (UK) transmitter chain on 200 kHz — examination of the means by which the carriers of three transmitters are phase locked [BBC-RD-1979/27] N80-19317
Comparison of measured and predicted MUF's at a remote location — high frequency radio transmitters N80-19378

RADIO WAVES
Tropospheric effects on HF Propagation N80-19380
Hybrid ray-mode formulation of tropospheric propagation N80-19382
The geomorphology of the HF breakthrough phenomenon N80-19385
A mobile HF impulse source locator — thunderstorm location and tracking N80-19414

RADIOACTIVE WASTES
A comparison of the results of several heat transfer computer codes when applied to a hypothetical nuclear waste repository [ORNL/TM-7112] N80-19484
Nuclear waste management technology development activities [LA-7921-PR] N80-19937
Stress analysis of high-level waste canisters: Methods, applications, and design data [PNL-3036] N80-19939

RADIOLYSIS
Hydrogen and methane syntheses through radiation catalysis N80-19297

RADIOMETERS
A high resolution soil moisture radiometer N80-19161

RAFTS
Numerical analysis of rafts on visco-elastic media using eigenvector expansions [PB80-112907] N80-19570

RAIN
Some additional models for rainfall [AD-A077672] N80-19709

RAMAN SPECTRA
Laser-Raman flow-field diagnostics of two large hypersonic test facilities [AD-A078289] N80-19135

RAMJET ENGINES
Demonstration program for a flexible duct valve for ramjet engine fuel controls [AD-A078529] N80-19123

RANDOM ACCESS MEMORY
Random access memories. Citations from the NTIS data base [PB80-802333] N80-19658
Random access memories, volume 1. Citations from the Engineering Index data base [PB80-802341] N80-19659
Random access memories, volume 2. Citations from the Engineering Index data base [PB80-802358] N80-19660

RANDOM NOISE
Analysis of first and second order binary quantized digital phase-locked loops for ideal and white Gaussian noise inputs [NASA-CR-162854] N80-19056

RANDOM VARIABLES
On the weak law of large numbers D(0,1) [AD-A078130] N80-19928

RANDOM VIBRATION
Application of MIL-STD-810C dynamic requirements to USAF avionics procurements N80-19091

RANGEFINDING
Range vernier [AD-A077178] N80-19335

RANGELANDS
A critical comparison of remote sensing and other methods for nondestructive estimation of standing crop biomass [E80-10082] N80-19580

RANKINE CYCLE
A 15 kWe (nominal) solar thermal-electric power conversion concept definition study: Steam Rankin reciprocator system [NASA-CR-159591] N80-19612

RAPID TRANSIT SYSTEMS
Effects of tunnel and station size on the costs and service of subway transit systems [UMTA-CA-06-0116-79-2] N80-19989

RARE EARTH COMPOUNDS
Magnetic moment versus temperature curves of rare-earth iron garnets [AD-A077356] N80-19970

RARE EARTH ELEMENTS
Mossebauer effect investigations of the electronic and magnetic properties of rare earth metals and intermetallic hydrides [CONF-790739-4] N80-19973

RARE GASES
Photodesorption of gases from metal and semiconductor surfaces N80-19584

RAWINSONDES
A comparative analysis of Rawinsonde and Nimbus-6 and Tiros-N satellite profile data [AD-A079295] N80-19737

RAY TRACING
Hybrid ray-mode formulation of tropospheric propagation N80-19382

REACTION KINETICS
The corrosion of silicate materials by hydrogen gas and hydrofluoric acid solution [LBL-9887] N80-19214
Experimental assessment of nitrogen oxides transformations while sampling combustion products [AD-A079090] N80-19220
Kinetics and mechanism of desulfurization and denitrogenation of coal-derived liquids — quioline, indole, dibenzothiophene, and naphthalene [FE-2028-15] N80-19292

READ-ONLY MEMORY DEVICES
Military Adaptation of Commercial Item (MACI) program on Electrically Alterable Read Only Memory (EAROM) — metal-nitride-oxide semiconductors [AD-A078594] N80-19851

REAL TIME OPERATION
Real-time adaptive HF frequency management N80-19376
Toward global monitoring of the ionosphere in real time by a bottomside network: The geophysical requirements and the technological opportunity N80-19381
COPAS: A high speed real-time digital audio processor [BBC-RD-1979/26] N80-19465
Real-time simulation: An indispensable but overused evaluation technique N80-19620
E-3A navigational computer system real-time environmental simulator N80-19824
Simulation for whole life development N80-19839

RECIPROCATION
On the characteristics of centrifugal-reciprocating machines — cryogenic coolers [NASA-CR-162881] N80-19499

RECONNAISSANCE AIRCRAFT
A mission training simulator for the Nimrod MR MK 2 and some aspects of the derivation and verification of its system models N80-19626
Proceedings of the Association for Unmanned Vehicle Systems AUVS '79: 6th Annual Convention [AD-A077677] N80-20018

RECOVERABILITY
New remotely piloted vehicle launch and recovery concepts. Volume 1: Analysis, preliminary design and performance/cost trade studies [AD-A077475] N80-19066

RECOVERY PARACHUTES
Recovery system preliminary design. A simplified approach to determining staging, timing and altitude requirements for fast inflating parachutes
[AD-A077548] N80-19041
RECURSIVE FUNCTIONS
A recursion theoretic analysis of certain generalizations of Ramsey's theorem and of the Gale-Stewart theorem N80-19693
RECYCLING
Energy conservation in the U.S. economy from increased recycle of obsolete steel scrap N80-19492
RED SHIFT
Gravitational redshift space-probe experiment
[NASA-CR-161409] N80-19999
REDUCTION (CHEMISTRY)
Thermochemical processes for hydrogen production
[LA-7937-PR] N80-19299
REFERENCE ATMOSPHERES
The NASA/MSFC global reference atmospheric model: MOD 3 (with spherical harmonic wind model)
[NASA-CR-3256] N80-19704
REFLECTION
Investigation of higher order forbidden reflections in Si and Ge using synchrotron radiation N80-19963
REFLECTORS
Advanced sunflower antenna concept development — stowable reflectors N80-19147
FY-79 - LSST antenna technology development N80-19150
Development of the Maypole (Hoop/Column) deployable reflector concept for large space systems applications N80-19151
Electrostatic forming N80-19154
Surface measuring technique — using a laser to scan the surface of a reflector N80-19155
Asymptotic high frequency techniques for UHF and above antennas — for ships
[AD-A077651] N80-19330
REFRACTIVITY
Tropospheric effects on HF Propagation N80-19380
REGENERATION (ENGINEERING)
Argon/UF6 plasma experiments: UF6 regeneration and product analysis
[NASA-CR-3258] N80-19935
REGIONAL PLANNING
Regional systems development for geothermal energy resources. Pacific region: California and Hawaii. Task 1: Implementation plan development — for the generation of electric power
[DOE/ET-28432-1] N80-19604
Regional systems development for geothermal energy resources. Pacific region: California and Hawaii. Task 2: Regional program monitoring and progress evaluation — for the generation of electric power
[DOE/ET-28432-2] N80-19605
Regional systems development for geothermal energy resources. Pacific region: California and Hawaii. Task 3: Water resources evaluation — for generation of electric power
[DOE/ET-28432-3/1] N80-19606
Regional systems development for geothermal energy resources. Pacific region: (California and Hawaii). Task 3: Water resources evaluation, appendices — for generation of electric power
[DOE/ET-28432-3/2] N80-19607
REGRESSION ANALYSIS
Measuring technological change in jet fighter aircraft
[AD-A077393] N80-19084
A modification of Hudson's technique for piecewise linear regression models N80-19894
Extensions of the Box-Cox transformation to grouped-data situations N80-19913
A density-quantile function approach to choosing order statistics for the estimation of location and scale parameters N80-19915
Trimming the least squares estimator in the linear model by using a preliminary estimator
[AD-A078115] N80-19920
Robust methods for factorial experiments with outliers
[AD-A077890] N80-19921
On the asymptotic normality of robust regression estimates
[AD-A077666] N80-19922
REINFORCING FIBERS
Effects of proof-test on the strength and fatigue life of a unidirectional composite
[AD-A076304] N80-19211
RELATIVISTIC EFFECTS
Reintroducing the concept of force into relativity theory
[ORO-3992-367] N80-19977
RELATIVISTIC ELECTRON BEAMS
The theory of free electron lasers
[AD-A075363] N80-19482
Theory of the resistive hose instability in relativistic electron beams — magnetohydrodynamic instability of a relativistic electron beam propagating in a preionized plasma
[AD-A078189] N80-19806
RELATIVISTIC THEORY
Reintroducing the concept of force into relativity theory
[ORO-3992-367] N80-19977
RELIABILITY
Accuracy and repeatability indices for joint oil analysis program data
[AD-A078156] N80-19266
Assessment of HF communications reliability N80-19377
Reliability improvement warranty: An overview N80-19527
Reliability clauses in contracts N80-19528
The increase of the reliability of electronic equipment subject to reliability clauses N80-19529
Reliability improvement due to the application of clauses of operational reliability N80-19530
Production Reliability Assurance (PRA): Testing N80-19531
Methods used for discerning the reliability of military aircraft radar N80-19532
A fault tolerant architecture approach to avionics reliability improvement N80-19533
Impacts of technologies selected on the reliability and operational availability of equipments. Cost considerations N80-19536
Military adaption of a commercial VOR/ILS airborne radio with a reliability improvement warranty N80-19540
Reliability and support data for statistical evaluation — using a management information system N80-19559
The reliability improvement warranty and its application to the F-16 multinational fighter program N80-19561
RELIABILITY ANALYSIS
Multistate reliability models and some extensions of a univariate shock model N80-19513
Emulation applied to reliability analysis of reconfigurable, highly reliable, fault-tolerant computing systems N80-19541
Reliability assurance for large scale integrated circuits N80-19542
Reliability of high-brightness CRTs for airborne displays N80-19543
Reliability investigations on an automatic test system — for an air-to-ship missile system N80-19544
Application of the lognormal distribution to corrective maintenace downtimes N80-19545
Reliability management of the avionic system of a military strike aircraft N80-19546
Introduction to software reliability: A key issue of computing systems reliability N80-19547
Software reliability: Understanding and improving it N80-19548
Quantitative assessments of software reliability N80-19550
An analysis of software reliability prediction models N80-19551
Software development for TORNADO: A case history from the reliability and maintainability aspect N80-19554
RELIABILITY ENGINEERING
Microcracks and metallization burnout
[AD-A078019] N80-19430
Evaluation of and recommended change to the Reliability Improvement Warranty (RIW) guidelines
[AD-A077672] N80-19518
Avionics Reliability, Its Techniques and Related Disciplines — conferences
[AGARD-CP-261] N80-19519
An analysis of the evolution of the reliability and maintainability disciplines N80-19520
Difficulties in predicting avionics reliability N80-19521
Reliability growth models N80-19522
A simulation program for the determination of system reliability of complex avionic systems N80-19523
Micro-electronic systems reliability prediction N80-19524
Markovian availability model for a network of communicating computers N80-19525
Trends in reliability modeling technology for fault tolerant systems N80-19534
Nonelectronic aspects of avionic system reliability — actuation N80-19535
Reliability growth through environmental simulation — electronic equipment N80-19538
The A-7 head-up display reliability programme N80-19539
Introduction to software reliability: A key issue of computing systems reliability N80-19547
Formal methods for achieving reliable software N80-19549
The integrated management of reliability and maintainability in procurement N80-19558
General reliability and safety methodology and its application to wind energy conversion systems
[SERI/TR-35-234] N80-19645
Using assertions for adaptive testing of software
[AD-A077398] N80-19675
Delta-exact lower confidence bounds for series system reliability
[AD-A077524] N80-19823
REMOTE CONTROL
Toward a remotely-manned energy and production economy
[AD-A078069] N80-19804
REMOTE REGIONS
New technology to improve HF circuit reliability and availability for remote regions N80-19417
Survivability of remote site alternate energy systems. Volume 1: Survivability analysis
[AD-A078118] N80-19636
REMOTE SENSORS
Orbit dynamics and geographical coverage capabilities of satellite-based solar occultation experiments for global monitoring of stratospheric constituents
[NASA-TP-1606] N80-19142
Theoretical modelling and experimental data matching for active and passive microwave remote sensing of Earth terrain N80-19360
Ground-wave and sky-wave sea-state sensing experiments in the United Kingdom N80-19400
Development of HF skywave radar for remote sensing applications N80-19402
Definition of subsurface features by geophysical probing N80-19408
Experimental pulsed laser remote crosswind measurement system. Feasibility study and design, part 5
[AD-A077631] N80-19721
Analyze, calculate, and develop techniques for weather satellite imagery data
[AD-A077292] N80-19735
Conference of Remote Sensing Educators (CORSE-78)
[NASA-CP-2102] N80-20003
History and future of remote sensing technology and education N80-20004
Is remote sensing far out? N80-20005
The attributes of a well-trained remote sensing technologist N80-20006
A multidisciplinary approach to remote sensing education N80-20007
Remote sensing research activities related to academic institutions N80-20008
NASA programs in technology transfer and their relation to remote sensing education N80-20009
NASA's western regional applications training activity N80-20010
Opportunities and problems in introducing or expanding the teaching of remote sensing in universities N80-20011
Computer applications in remote sensing education N80-20013
Textbooks and technical references for remote sensing N80-20014

The pointable multispectral linear array system and the large format camera for early 1980 shuttle payloads N80-20015
The reduction of remote sensing data by visual means — education N80-20017

REMOTELY PILOTED VEHICLES
New remotely piloted vehicle launch and recovery concepts. Volume 1: Analysis, preliminary design and performance/cost trade studies [AD-A077475] N80-19066
Remotely piloted vehicles, volume 2. A bibliography with abstracts [PB80-802119] N80-19089
Proceedings of the Association for Unmanned Vehicle Systems AUVS '79: 6th Annual Convention [AD-A077877] N80-20018

REPRODUCTION (COPYING)
Color ink-jet demonstration program [AD-A075377] N80-19476

RESCUE OPERATIONS
Feasibility study on a Canadian civil SAR plan for search and rescue duties [AD-A075392] N80-19060

RESEARCH
Remote sensing research activities related to academic institutions N80-20008

RESEARCH FACILITIES
Design considerations for attaining 250-knot test velocities at the aircraft landing dynamics facility [NASA-TM-80222] N80-19132
Air Force Flight Dynamics Laboratory fiscal year 1981. Technical objective document [AD-A078973] N80-20020

RESIDENTIAL AREAS
Characterization and assessment of selected solar thermal energy systems for residential and process heat applications [LA-7995-TASE] N80-19648

RESIDUAL GAS
Glass shell manufacturing in space — residual gases in spherical shells made from metal-organic gels [NASA-CR-161406] N80-19141

RESIDUAL STRESS
An analysis of residual stresses and displacements due to radial expansion of fastener holes [AD-A076370] N80-19569

RESIDUES
Fluid coking of coal liquefaction residues: The fourth residue [FE-2422-28] N80-19304

RESOLUTION
Analysis of NOAA-MSFC GOES X-ray telescope [NASA-CR-161397] N80-19995

RESOURCES MANAGEMENT
Alaskan environmental research. Section 12.0 of part 2: Ecological sciences [PNL-2850-PT-2-SUPPL] N80-19668

RETRACTABLE EQUIPMENT
Large Space Systems Technology, 1979 — antenna and space platform systems conference [NASA-CP-2116] N80-19145
FY-79 - LSST antenna technology development N80-19150
Development of the Maypole (Hoop/Column) deployable reflector concept for large space systems applications N80-19151

RHEOLOGY
Memory effects in turbulence [NASA-TM-75516] N80-19451

RIBS (SUPPORTS)
Offset weap rib concept and development N80-19146

RIDING QUALITY
Evaluation and calibration of road meter devices for measuring pavement rideability [PB80-110422] N80-19315

RIGID STRUCTURES
Prediction of the structural damping of a vibrating stiffened plate N80-19574

RING LASERS
Laser vibration gyroscope [BLL-RTS-11579] N80-19467

RING STRUCTURES
Dynamic structural model of a submerged ring [AD-A078157] N80-19568

RISK
Assessment of the risk due to release of carbon fiber in civil aircraft accidents, phase 2 N80-19200
Assessment of risk due to the use of carbon fiber composites in commercial and general aviation N80-19201

RIVETED JOINTS
Evaluation of dynamically riveted joints [AD-A077223] N80-19504
Damping effects in joints and experimental tests on riveted specimens N80-19584

RIVETS
Evaluation of dynamically riveted joints [AD-A077223] N80-19504

ROADS
Evaluation and calibration of road meter devices for measuring pavement rideability [PB80-110422] N80-19315

ROBOTS
General methods to enable robots with vision to acquire, orient and transport workpieces [PB80-106388] N80-19608

ROCKET ENGINE CASES
Failure analysis and resin evaluation if IUS SRM-1 92 inch prototype motor case [AD-A077407] N80-19189

ROCKET ENGINE DESIGN
Orbital Transfer Vehicle (OTV) advanced expander cycle engine point design study [NASA-CR-161389] N80-19179
Advanced oxygen-hydrocarbon rocket engine study [NASA-CR-161390] N80-19186

ROCKET EXHAUST
Bipropellant engine plume contamination program. Volume 2: Chamber measurements, phase 2 [AD-A077435] N80-19187
Bipropellant engine plume contamination program. Volume 1: Chamber measurements, phase 1 [AD-A078412] N80-19188
Rocket motor blast effects and proposed ablative protection for RAM launching system EX 43 [AD-A077037] N80-19190
Experimental studies of multiple-scattered light from latex spheres — in rocket exhaust [AD-A078322] N80-19191

ROCKET FLIGHT
Investigation of the airflow at rocket trajectory and wind sensor locations of a model helicopter simulating low speed flight. Application of model helicopter testing, laser velocity, and rotor wake flow visualization to investigate the aerodynamic interference at rocket trajectories and wind sensors of a helicopter operating in low speed flight [AD-A075378] N80-19039

ROCKET LAUNCHING
The 19702A GSRS, missile number 310, round number B-33, 27 August 1979 [AD-A079990] N80-19726
The 19702A GSRS, Missile Number BR-3, Round Number B-35, 31 August 1979 [AD-A079991] N80-19727
The 19702A GSRS, missile numbers 308, 309, round numbers B-31, B-32, 18 August 1979 [AD-A079992] N80-19728
The 19306B GSRS, Missile Numbers 1043, 1045, Round Numbers V-64, V-65, 17 August 1979 [AD-A079993] N80-19729
The 190702A GSRS, Missile Number 004, Round Number B-30, 17 August 1979 [AD-A079999] N80-19730
The 19702D GSRS, Missile Number 023, Round Number B-36, 6 September 1979 [AD-A080000] N80-19731
The 12821A Lance, Missile Number 4819, Round Number 335 NCL, 13 August 1979 [AD-A079995] N80-19732
The 19702A GSRS, missile number 311, round number B-39, 10 September 1979: Meteorological Data Report [AD-A080001] N80-19733
The 19304D GSRS, missile number 1063, round number V-67, 29 August 1979: Meteorological Data Report [AD-A080062] N80-19734

ROCKET-BORNE INSTRUMENTS
Gravitational redshift space-probe experiment [NASA-CR-161409] N80-19999

ROCKS
Indirect deformation (strain) measurements and calibrations in Sandia triaxial apparatus for rock testing to 250 C [SAND-79-0114] N80-19696

ROLLER BEARINGS
Calculated and experimental data for a 118-mm bore roller bearing to 3 million DN [NASA-TM-81427] N80-19496

ROLLING MOMENTS
Experimental investigation of a circulation control aileron [AD-A078825] N80-19048

ROTARY WING AIRCRAFT
Rotorcraft identification experience N80-19101

ROTARY WINGS
A flight investigation of blade section aerodynamics for a helicopter main rotor having NLR-1T airfoil sections [NASA-TM-80166] N80-19033
NADC ABC rotor maps [AD-A078802] N80-19083

ROTATING BODIES
Wind tunnel tests of a spinning 105 mm artillery shell model with canard control surfaces [AR-001-908] N80-19032

ROTATING CYLINDERS
Calculated and experimental data for a 118-mm bore roller bearing to 3 million DN [NASA-TM-81427] N80-19496

ROTATING FLUIDS
Navier-Stokes solutions for spin-up from rest in a cylindrical container [AD-A077115] N80-19455

ROTATING SHAFTS
Ice seal for rotating shafts [AD-A078308] N80-19506

ROTATING STALLS
Tests of an improved rotating stall control system on a J-85 turbojet engine [AD-A077704] N80-19109
Basic studies of rotating stall in axial flow compressors [AD-A077690] N80-19115

ROTOR AERODYNAMICS
Aerodynamic and acoustic investigations of axial flow fan and compressor blade rows, including three-dimensional effects [AD-A077712] N80-19116

ROTORS
Miniature synchronous motors with permanent magnet rotors [BLL-RTS-11801] N80-19423
Teetered, tip-controlled rotor: Preliminary test results from Mod-0 100-kW experimental wind turbine [NASA-TM-81445] N80-19613

RUBBER
Rapid laboratory method for testing outgassing of thermostable plastics and rubber N80-19786

RUBIDIUM
X-ray absorption studies of graphite intercalates and metal ammonia solutions [LBL-9640] N80-19212

RUNWAYS
A computer program for estimating aircraft landing distance [AD-A077169] N80-19088

S

S-N DIAGRAMS
Fatigue strength of trip steels [AD-A078592] N80-19245

SAFETY FACTORS
Investigations of the safety of Li/SOCl2 batteries [AD-A077894] N80-19635

SAFETY MANAGEMENT
Propulsion and energetics panel Working Group 11 on aircraft fire safety. Volume 2: Main report [AGARD-AR-132-VOL-2] N80-19047
Evaporation and dispersion of hazardous materials [AD-A077399] N80-19291
General reliability and safety methodology and its application to wind energy conversion systems [SERI/TR-35-234] N80-19645

SAMPLERS
Automated syringe sampler [NASA-CASE-LAR-12308-1] N80-19664

SAN MARCO SATELLITE
Vibration damping on San Marco satellites: results and comments N80-19579

SATELLITE ATTITUDE CONTROL
Attitude control study for a large flexible spacecraft using a Solar Electric Propulsion System (SEPS)
[NASA-CR-162878] N80-19183
SATELLITE INSTRUMENTS
Analysis of NOAA-MSFC GOES X-ray telescope
[NASA-CR-161397] N80-19995
SATELLITE OBSERVATION
Visible flux variations across finite clouds — satellite images N80-19699
A comparative analysis of Rawinsonde and Nimbus-6 and Tiros-N satellite profile data
[AD-A078295] N80-19737
The determination of atmospheric structure from quantitative satellite data
[AD-A078980] N80-19738
SATELLITE ORBITS
Orbit dynamics and geographical coverage capabilities of satellite-based solar occultation experiments for global monitoring of stratospheric constituents
[NASA-TP-1606] N80-19142
Landsat MSS coordinate transformations — determining satellite orbits
[AD-A078418] N80-19596
SATELLITE SOUNDING
The geomorphology of the HF breakthrough phenomenon N80-19395
Coupling between the neutral and ionized upper atmosphere during disturbed conditions N80-19396
Analyze, calculate, and develop techniques for weather satellite imagery data
[AD-A077282] N80-19735
The determination of atmospheric structure from quantitative satellite data
[AD-A078980] N80-19738
SATELLITE TRANSMISSION
Scintillation of UHF Satcom signals, ocurrence at Guam from mid-March 1978 - June 1979
[AD-A078287] N80-19328
Strategic blue-green optical communications program plan. Investment strategy toward an optical solution for satellite-to-submarine information transfer
[AD-A078345] N80-19344
SATELLITE-BORNE PHOTOGRAPHY
DMSP auroral images and the Goose Bay ionosphere
[AD-A077023] N80-19691
SCATTERING CROSS SECTIONS
A note on the revised galactic neutron spectrum of the Ames collaborative study
[NASA-CR-150554] N80-20002
SCATTEROMETERS
Development and usage of a false color display technique for presenting Seasat-A scatterometer data
[NASA-CR-159203] N80-19862
SCENE ANALYSIS
LANDSAT digital analysis of the initial recovery of the Kokolik River tundra fire area, Alaska
[E80-10080] N80-19588
SCINTILLATION
Scintillation of UHF Satcom signals, ocurrence at Guam from mid-March 1978 - June 1979
[AD-A078287] N80-19328
Model computations of radio wave scintillation caused by equatorial bubbles
[AD-A077028] N80-19690
SCRAP
Energy conservation in the U.S. economy from increased recycle of obsolete steel scrap N80-19492
SEA ICE
SMMR simulator radiative transfer calibration model. 1: Derivation
[E80-10081] N80-19589
SEA ROUGHNESS
SMMR simulator radiative transfer calibration model. 1: Derivation
[E80-10081] N80-19589
SEA STATES
Ground-wave and sky-wave sea-state sensing experiments in the United Kingdom N80-19400
Sea-state directional spectra observed by HF Doppler radar N80-19401
Ocean swell parameters from narrow-beam HF radar sea echo N80-19404
SEA WATER
Corrosion of aluminum alloys in high velocity seawater
[AD-A078435] N80-19251
The effect of seawater on polymers
[AD-A077324] N80-19281
SEALING
Sealing techniques for ultra-high vacuum systems — soldering techniques for metal to metal bonding and metal to nonmetal bonding
[BLL-RTS-11956] N80-19312
SEALS (STOPPERS)
Ice seal for rotating shafts
[AD-A078308] N80-19506
SEARCH RADAR
Ku-band radar threshold analysis
[NASA-CR-160557] N80-19322
Proceedings of the Antenna Applications Symposium
[AD-A077167] N80-19334
SEARCHING
Feasibility study on a Canadian civil SAR plan for search and rescue duties
[AD-A075392] N80-19050
SEASAT-A SATELLITE
Development and usage of a false color display technique for presenting Seasat-A scatterometer data
[NASA-CR-159203] N80-19862
SEDIMENT TRANSPORT
Remote sensing applications to resource problems in South Dakota — Chamberlain, Rapid City, Watertown; Spink County; Lake Herman and Six-Mile Creek Watersheds; and Missouri River waterfowl
[E80-10086] N80-19583
Delta7: A computer model of Delta growth
[AD-A077053] N80-19692
SEISMOLOGY
Body and surface wave modeling of observed seismic events
[AD-A078058] N80-19694
SELENIUM
Emerging materials systems for solar cell applications-Cu/sub 2-x/Se
[DOE/ET-23005-T2] N80-19653
SELF ERECTING DEVICES
Space fabrication: Graphite composite truss welding and cap forming subsystems N80-19158
SEMICONDUCTING FILMS
Preparation and characterization of hydrogenated amorphous boron thin films and thin film solar cells produced by glow discharge decomposition methods
[DOE/ET-2304-1] N80-19652
SEMICONDUCTOR DEVICES
Powder metallurgy of aluminum. Citations from the NTIS data base
[PB80-803216] N80-19259
Nonequilibrium phenomena in superconducting phase-slip centers
[AD-A078441] N80-19442
Research in remote signal transmission electronics
[ORNL/SUB-7644/10] N80-19444
Josephson junctions, volume 2. Citations from the Engineering Index data base
[PB80-802883] N80-19976
SEMICONDUCTOR LASERS
Injection laser waveguide coupler
[AD-A077030] N80-19484
SEMICONDUCTORS (MATERIALS)
Final state correlation effects in auger lineshapes: Application to silicon dioxide
[AD-A078037] N80-19221
Emerging materials systems for solar cell applications-Cu/sub 2-x/Se
[DOE/ET-23005-T2] N80-19653
Cadmium sulfide solar cells, volume 1. Citations from the NTIS data base
[PB80-802218] N80-19656
Photodesorption of gases from metal and semiconductor surfaces N80-19964
Study of the electronic surface state of 3-5 compounds — physics and chemistry of indium phosphates, gallium arsenides, and gallium antimonides
[AD-A078304] N80-19969
Determinations of electronic states in crystalline semiconductors and metals by angle-resolved photoemission
[LBL-8429] N80-19972
SEQUENTIAL ANALYSIS
Generalizations of the sequential sign detector
[AD-A079110] N80-19889
SERIES (MATHEMATICS)
Hydroelastic vibration analysis of partially liquid-filled shells using a series representation of the liquid
[NASA-TP-1558] N80-19583
SERVICE LIFE
Fourier Transform Infrared Spectroscopy (FTIS). Volume 1: Technical Report — service life of solid rocket propellants
[AD-A079996] N80-19227
SET THEORY
A recursion theoretic analysis of certain generalizations of Ramsey's theorem and of the Gale-Stewart theorem N80-19693
Generalizations of compactness and cardinal invariants of spaces N80-19925
SETTLING
Surface settlement of a finite elastic layer whose modulus increases linearly with depth
[PB80-112899] N80-19571
SHAPES
Consolidation of titanium powder to near net shapes
[AD-A078039] N80-19239
SHIPS
Asymptotic high frequency techniques for UHF and above antennas — for ships
[AD-A077851] N80-19330
SHOCK MEASURING INSTRUMENTS
Development of passive high pressure gauges: Field experiment
[AD-A077194] N80-19474
SHOCK WAVES
Normal ionizing shock as a theta pinch preionizer
[LA-8064-MS] N80-19980
SHORT TAKEOFF AIRCRAFT
Flight evaluation of configuration management system concepts during transition to the landing approach for a powered-lift STOL aircraft
[NASA-TM-81146] N80-19127
SHORT WAVE RADIO TRANSMISSION
Radio-link computations optimize pattern sharing of shortwave antennas N80-19419
SHROUDS
Investigation of fan blades shroud mechanical damping
[AD-A078439] N80-19120
SIDESLIP
Application of the Estimation-Before-Modeling (EBM) system identification method to the high angle of attack/sideslip flight of the T-2C jet trainer aircraft. Volume 2: Simulation study using T-2C wind tunnel model data
[AD-A079923] N80-19061
Application of the Estimation-Before-Modeling (EBM) system identification method to the high angle of attack/sideslip flight of the T-2C jet trainer aircraft. Volume 3: Identification of T-2C aerodynamics stability and control characteristics from actual flight test data
[AD-A079924] N80-19072
Application of the Estimation-Before-modeling (EBM) system identification method to the high angle of attack/sideslip flight of the T-2C jet trainer aircraft. Volume 1: Executive summary
[AD-A080025] N80-19073
SIGNAL ANALYSIS
Direction and Doppler characteristics of medium and long path HF signals within the night-time sub-auroral region N80-19391
SIGNAL DISTORTION
Analytical studies of phase estimation techniques, volume 1
[AD-A078006] N80-19944
SIGNAL FADING
Channel measurement for wideband digital communication over fading channels N80-19316
Airborne measurements of electromagnetic wave reflections from land and sea water N80-19355
SIGNAL GENERATORS
Adjacent-signal characteristics and co-channel interference of a land mobile lincompex system in the VHF band
[BLL-RTS-11914] N80-19318
SIGNAL PROCESSING
Contributations to signal processing for the hallo program
[AD-A078217] N80-19326

Analog binary programmable transversal filter [AD-A078980] N80-19437
COPAS: A high speed real-time digital audio processor [BBC-RD-1979/26] N80-19485

SIGNAL TRANSMISSION
Research in remote signal transmission electronics [ORNL/SUB-7644/10] N80-19444

SIGNATURE ANALYSIS
Advanced infrared signature prediction program. Spectral calculation of radiation from a turbine propulsion system as intercepted by an observer (SCORPION). Volume 3: Analysis [AD-A078436] N80-19124

SILANES
Photochemistry and radiation chemistry of volatile silanes and germanes [COO-3416-13] N80-19229
Formation of organosilicon compounds. 58: Synthesis of a carbosilane with propellane structure [RAE-UB-TRANS-2029] N80-19265

SILICATES
The corrosion of silicate materials by hydrogen gas and hydrofluoric acid solution [LBL-9667] N80-19214

SILICON
Studies of silicon p-n junction solar cells [NASA-CR-162832] N80-19609
Slicing of silicon into sheet material. Silicon sheet growth development for the large area silicon sheet task of the low cost solar array project [NASA-CR-162828] N80-19623
Investigation of higher order forbidden reflections in Si and Ge using synchrotron radiation N80-19983

SILICON ALLOYS
GE-SI supersonic FLIR window [AD-A078371] N80-19948

SILICON DIOXIDE
Final state correlation effects in auger lineshapes: Application to silicon dioxide [AD-A079037] N80-19221

SILICON NITRIDES
Sintering of beta silicon nitride solid solutions containing metal oxide [AD-A077415] N80-19209
Improved impact fracture resistance in oxidation-toughened Si3n4-20 vol% ZrO2 [AD-A078833] N80-19241

SILICONES
Develop silicone encapsulation systems for terrestrial silicon solar arrays [NASA-CR-162840] N80-19617

SIMULATION
Simulation for integration with dynamic tests of the logical elements of principal onboard computers N80-19842

SIMULATORS
Crew station design facility feasibility study [AD-A078134] N80-19064
SMMR simulator radiative transfer calibration model. 1: Derivation [E80-10081] N80-19589
E-3A navigational computer system real-time environmental simulator N80-19824

SINGLE CRYSTALS
Conduction in polydiacetylene bilayers [AD-A078755] N80-19279
Determinations of electronic states in crystalline semiconductors and metals by angle-resolved photoemission [LBL-9429] N80-19972

SINTERING
Sintering of beta silicon nitride solid solutions containing metal oxide [AD-A077415] N80-19209
Powder metallurgy of aluminum. Citations from the Engineering Index data base [PB80-803224] N80-19260

SIZE (DIMENSIONS)
Effects of tunnel and station size on the costs and service of subway transit systems [UMTA-CA-06-0116-79-2] N80-19989

SKIN FRICTION
Influence of roughness and blowing on compressible turbulent boundary layer flow — skin friction drag [AD-A077642] N80-19461

SKY WAVES
Ground-wave and sky-wave sea-state sensing experiments in the United Kingdom N80-19400
Duvelopment of HF skywave radar for remote sensing applications N80-19402

SLEEP DEPRIVATION
Effects of unusual schedules of daily activity and sleep deprivation on man's functional state and work fitness N80-19758

SLEEVES
Thrust, sleeve and jewel bearings, volume 2. Citations from the Engineering Index data base — bibliographies [PB80-802830] N80-19511
Thrust, sleeve and jewel bearings. Citations from the NTIS data base — bibliographies [PB80-802822] N80-19512

SNOW
SMMR simulator radiative transfer calibration model. 1: Derivation [E80-10081] N80-19589

SNOW COVER
NOAA satellite monitoring of snow cover in the Northern Hemisphere during the winter of 1977 N80-19584

SODIUM CARBONATES
Effect of sodium bicarbonate on reactivity and trophics of vestibuler analyzer N80-19789

SOIL EROSION
Use of remote sensing for land use policy formulation — Kalamazoo, Lake, Mecosta, Newaygo, Oscecla, and Wexford counties, Michigan [E80-10085] N80-19592

SOIL MECHANICS
Moisture movement and moisture equilibria in pavement systems [PB80-120082] N80-19314

SOIL MOISTURE
A high resolution soil moisture radiometer N80-19181
Moisture movement and moisture equilibria in pavement systems [PB80-120082] N80-19314
LANDSAT digital analysis of the initial recovery of the Kokolik River tundra fire area, Alaska [E80-10080] N80-19588
SMMR simulator radiative transfer calibration model. 1: Derivation [E80-10081] N80-19589
Remote sensing applications to resource problems in South Dakota — Chamberlain, Rapid City, Watertown; Spink County; Lake Herman and Six-Mile Creek Watersheds; and Missouri River waterfowl [E80-10086] N80-19590

SOIL SCIENCE
Prototype overland flow test data: June 1977 - May 1978 [AD-A078743] N80-19597

SOLAR ARRAYS
LSA field test [NASA-CR-162798] N80-19611
Develop silicone encapsulation systems for terrestrial silicon solar arrays [NASA-CR-162840] N80-19617
Automated array assembly task in-depth study of silicon wafer surface texturizing [NASA-CR-162863] N80-19618
Slicing of silicon into sheet material. Silicon sheet growth development for the large area silicon sheet task of the low cost solar array project [NASA-CR-162828] N80-19623
Thermal performance evaluation of the Northrop model NSC-01-0732 concentrating solar collector array at outdoor conditions — Marshall Space Flight Center solar house test facility [NASA-CR-161354] N80-19628
Glass for low-cost photovoltaic solar arrays [NASA-CR-162885] N80-19633

SOLAR CELLS
Studies of silicon p-n junction solar cells [NASA-CR-162832] N80-19609
Development of economical improved thick film solar cell contact [NASA-CR-162849] N80-19619
A new method of metallization for silicon solar cells [NASA-CR-162823] N80-19620
Survivability of remote site alternate energy systems. Volume 1: Survivability analysis [AD-A078118] N80-19636
On influencing the operating temperatures of Motorola and Arco solar photovoltaic modules [COO-4094-59] N80-19649
Preparation and characterization of hydrogenated amorphous boron thin films and thin film solar cells produced by glow discharge decomposition methods [DOE/ET-2304-1] N80-19652
Emerging materials systems for solar cell applications-Cu/sub 2-x/Se [DOE/ET-23005-T2] N80-19653
Cadmium sulfide solar cells, volume 1. Citations from the NTIS data base [PB80-802218] N80-19658

SOLAR COLLECTORS
High temperature solar thermal receiver [NASA-CR-162831] N80-19621
Low cost point focus solar concentrator. Phase 1: Preliminary design [JPL-9950-273] N80-19622
Low cost point focus solar concentrator, phase 1 [NASA-CR-162948] N80-19624
Low-costs point-focus solar concentrator, phase 1 [NASA-CR-162839] N80-19625
Thermal performance evaluation of the Northrop model NSC-01-0732 concentrating solar collector array at outdoor conditions — Marshall Space Flight Center solar house test facility [NASA-CR-161354] N80-19628
Annual technical report, fiscal year 1979. Volume 1: Executive summary [NASA-CR-159715] N80-19632

SOLAR CORONA
Coronal magnetic structure and the latitude and longitude distribution of energetic particles, 1-5 AU [NASA-CR-161291] N80-19662

SOLAR ECLIPSES
Orbit dynamics and geographical coverage capabilities of satellite-based solar occultation experiments for global monitoring of stratospheric constituents [NASA-TP-1606] N80-19142
Ionospheric effects of a solar eclipse in the Cape Varde Islands N80-19399

SOLAR ELECTRIC PROPULSION
Attitude control study for a large flexible spacecraft using a Solar Electric Propulsion System (SEPS) [NASA-CR-162978] N80-19183

SOLAR ENERGY
Energy accounting for solar and alternative energy sources [ORAU/IEA(R)-79-11] N80-19647
Characterization and assessment of selected solar thermal energy systems for residential and process heat applications [LA-7995-TASE] N80-19648

SOLAR ENERGY CONVERSION
A 15 kWe (nominal) solar thermal-electric power conversion concept definition study: Steam Rankin reciprocator system [NASA-CR-159591] N80-19612
Solar power satellite system definition study. Volume 1, phase 2: Executive summary [NASA-CR-160540] N80-19631
Annual technical report, fiscal year 1979. Volume 1: Executive summary [NASA-CR-159715] N80-19632
The effects of regional insolation differences upon advanced solar thermal electric power plant performance and energy costs [NASA-CR-162886] N80-19634
Solar powered liquid piston Stirling cycle irrigation pump [SAN/1894-1] N80-19641
Solar electric power generation, volume 3. Citations from the Engineering Index data base [PB80-803034] N80-19657
Solar electric power generation, volume 2. Citations from the NTIS data base [PB80-803000] N80-19658
Solar electric power generation, volume 3. Citations from the NTIS data base [PB80-803018] N80-19659
Solar electric power generation, volume 2. Citations from the Engineering Index data base [PB80-803026] N80-19660

SOLAR FLARES
Empirical studies of solar flares: Comparison of X-ray and H alpha filtergrams and analysis of the energy balance of the X-ray plasma [NASA-CR-161405] N80-20001

SOLAR GENERATORS
Solar-powered sun tracker [AD-A078653] N80-19640

Solar electric power generation, volume 3. Citations from the Engineering Index data base [PB80-803034] N80-19657
Solar electric power generation, volume 2. Citations from the NTIS data base [PB80-803000] N80-19658
Solar electric power generation, volume 3. Citations from the NTIS data base [PB80-803018] N80-19659
Solar electric power generation, volume 2. Citations from the Engineering Index data base [PB80-803026] N80-19660

SOLAR HEATING
Solar energy system performance evaluation: Seasonal report for SEMCO, Lowshatchee, Florida [NASA-CR-161379] N80-19627
Solar energy system performance evaluation: A seasonal report for SEMCO, Macon, Georgia [NASA-CR-161380] N80-19629
Installation guidelines for solar heating system, single-family residence at New Castle, Pennsylvania [NASA-CR-161355] N80-19630

SOLAR MAGNETIC FIELD
Coronal magnetic structure and the latitude and longitude distribution of energetic particles, 1-5 AU [NASA-CR-161391] N80-19682
Empirical studies of solar flares: Comparison of X-ray and H alpha filtergrams and analysis of the energy balance of the X-ray plasma [NASA-CR-161405] N80-20001

SOLAR POWER SATELLITES
Solar power satellite system definition study. Volume 3: Operations and systems synthesis, phase 2 [NASA-CR-160480] N80-19616
Solar power satellite system definition study. Volume 1, phase 2: Executive summary [NASA-CR-160540] N80-19631

SOLAR PROTONS
Coronal magnetic structure and the latitude and longitude distribution of energetic particles, 1-5 AU [NASA-CR-161391] N80-19682

SOLAR SEA POWER PLANTS
Solar sea power plants. Citations from the NTIS data base [PB80-802580] N80-19661
Solar seapower plants. Citations from the Engineering Index data base [PB80-802598] N80-19662

SOLAR TERRESTRIAL INTERACTIONS
On the role of the atmospheric zonal index cycle in solar/terrestrial coupling [CONF-7906119-1] N80-19697

SOLAR WIND
Empirical studies of solar flares: Comparison of X-ray and H alpha filtergrams and analysis of the energy balance of the X-ray plasma [NASA-CR-161405] N80-20001

SOLAR X-RAYS
Empirical studies of solar flares: Comparison of X-ray and H alpha filtergrams and analysis of the energy balance of the X-ray plasma [NASA-CR-161405] N80-20001

SOLDERING
Sealing techniques for ultra-high vacuum systems — soldering techniques for metal to metal bonding and metal to nonmetal bonding [BLL-RTS-11858] N80-19312

SOLID PROPELLANT COMBUSTION
Solid propellant combustion mechanism research [AD-A078831] N80-19301

SOLID ROCKET PROPELLANTS
Fourier Transform Infrared Spectroscopy (FTIS). Volume 1: Technical Report — service life of solid rocket propellants [AD-A078696] N80-19227
Fourier Transform Infrared Spectroscopy (FTIS). Volume 2: User's manual [AD-A078697] N80-19228
Investigation of thermoplastic elastomers as propellant binders [AD-A078691] N80-19289
Turbulent boundary-layer analysis and experimental investigation of erosive burning problem of composite solid propellants [AD-A077351] N80-19299

SOLID SOLUTIONS
Sintering of beta silicon nitride solid solutions containing metal oxide [AD-A077415] N80-19209

SOLID STATE
Solid-state switch modeling N80-19189
Solid state, surface and catalytic properties of oxides [COO-4067-1] N80-19974

SOLID STATE DEVICES
Power system control study. Phase 1: Integrated control techniques [AD-A078629] N80-19125
Geometry, artificial satellites, and orbit determination — use of solid state cameras to determine the orbits [AD-A077049] N80-19177
Development of mathematical models for solid state switching devices [NASA-CR-161367] N80-19426
Solid state power controller verification studies [AD-A078238] N80-19429

SOLID STATE PHYSICS
Advanced electronic technology [AD-A077569] N80-20021

SOLUTES
Electrochemistry of solutes in chloroaluminate melts and the development of related electrochemical methodology [AD-A078242] N80-19223

SOLUTIONS
Prospects for broadening the range of inorganic binding agents [RTS-11804] N80-19216

SONAR
Contributations to signal processing for the hallo program [AD-A078217] N80-19326

SONDES
Balloon systems and launch support [AD-A075385] N80-19037
Sounding rocket and balloon systems support [AD-A075364] N80-19038

SOUND FIELDS
Visualization of unsteady jets and aerodynamic noise fields [CUED/A-TURBO/TR-96] N80-19029

SOUND INTENSITY
Methods of sound simulation and applications in flight simulators [NASA-TM-75768] N80-19133

SOUND PRESSURE
On the feedback phenomenon of an impinging jet [AD-A078952] N80-19480

SOUND WAVES
Acoustic microscopy for nondestructive evaluation of materials [AD-A078088] N80-19516

SOUNDING
Possibilities of using radiation in the oxygen absorption line at lambda = 2.53 mm on slant paths for thermal sounding of the atmosphere [BLL-TRANS-1402-(9022.549)] N80-19681

SOUNDING ROCKETS
Sounding rocket and balloon systems support [AD-A075384] N80-19038
Measurement of electron densities in the middle atmosphere using rocket borne blunt probes [AD-A078148] N80-19686

SOUTH DAKOTA
Remote sensing applications to resource problems in South Dakota — Chamberlain, Rapid City; Watertown; Spink County; Lake Herman and Six-Mile Creek Watersheds; and Missouri River waterfowl [E80-10086] N80-19593

SPACE ERECTABLE STRUCTURES
Structural concepts for large spacecraft N80-19156
Erectable/deployable concepts for large space system technology N80-19157
Space fabrication: Graphite composite truss welding and cap forming subsystems N80-19158
Structural assembly in space N80-19159
Space construction and utility distribution N80-19160

SPACE FLIGHT
Rat plasma and tissue lipids after a long-term space flight N80-19773

SPACE HEATING (BUILDINGS)
Installation guidelines for solar heating system, single-family residence at New Castle, Pennsylvania [NASA-CR-161355] N80-19630
Modeling the space conditioning energy demand of a community as a function of weather [COO-1340-65] N80-19644
Characterization and assessment of selected solar thermal energy systems for residential and process heat applications [LA-7995-TASE] N80-19648

SPACE MAINTENANCE
Solar power satellite system definition study. Volume 3: Operations and systems synthesis, phase 2 [NASA-CR-160480] N80-19616

SPACE MANUFACTURING
Glass shell manufacturing in space — residual gases in spherical shells made from metal-organic gels [NASA-CR-161408] N80-19141
Development of a composite geodetic structure for space construction, phase 1A [NASA-CR-160558] N80-19144
Structural concepts for large spacecraft N80-19156
Erectable/deployable concepts for large space system technology N80-19157
Space fabrication: Graphite composite truss welding and cap forming subsystems N80-19158

SPACE PERCEPTION
Effect of field of view and monocular viewing on angular size judgements in an outdoor scene [NASA-TM-81176] N80-19792

SPACE PROCESSING
Space processing applications rocket project SPAR 4, engineering report [NASA-TM-78235] N80-19173

SPACE PROCESSING APPLICATIONS ROCKET
Space processing applications rocket project SPAR 4, engineering report [NASA-TM-78235] N80-19173

SPACE SHUTTLE ORBITERS
Orbiter fuel cell performance constraints. STS/OPS Pratt Whitney fuel cells. Operating limits for mission planning [NASA-TM-80958] N80-19610

SPACE SHUTTLE PAYLOADS
The pointable multispectral linear array system and the large format camera for early 1980 shuttle payloads N80-20015

SPACE SHUTTLES
Ku-band radar threshold analysis [NASA-CR-160557] N80-19322
Critique of a Hughes shuttle Ku-band data sampler/bit synchronizer [NASA-CR-160556] N80-19427

SPACE SURVEILLANCE (GROUND BASED)
Photometry of artificial satellites application to the Ground Electro-Optical Deep Space Surveillance (GEODSS) program [AD-A078675] N80-19176

SPACE TRANSPORTATION SYSTEM
Life sciences flight experiments program, life sciences project division, procurement quality provisions [NASA-TM-80962] N80-19515
Solar power satellite system definition study. Volume 1, phase 2: Executive summary [NASA-CR-160540] N80-19631

SPACE TRANSPORTATION SYSTEM 1 FLIGHT
Orbit attitude processor. STS-1 bench program verification test plan [JSC-16386] N80-19178

SPACEBORNE EXPERIMENTS
Life sciences flight experiments program, life sciences project division, procurement quality provisions [NASA-TM-80962] N80-19515
Gravitational redshift space-probe experiment [NASA-CR-161409] N80-19999

SPACECRAFT ANTENNAS
Offset wrap rib concept and development N80-19146
FY-79 - LSST antenna technology development N80-19150
Development of the Maypole (Hoop/Column) deployable reflector concept for large space systems applications N80-19151
Surface Accuracy Measurement Sensor for Deployable Reflector Antennas (SAMS DRA) N80-19152

SPACECRAFT CABIN ATMOSPHERES
Probability of altitude decompression disorders when breathing oxygen containing human waste gases N80-19762
Development of a nitrogen generation system [NASA-CR-152333] N80-19800

SPACECRAFT CHARGING
Spacecraft charging model: Two Maxwellian approximation
[AD-A077907] N80-19174
SPACECRAFT COMMUNICATION
The Mitre Interactive Communications Analysis Program (MICAP) N80-19835
SPACECRAFT COMPONENTS
High temperature penetrator assembly with bayonet plug and ramp-activated lock
[NASA-CASE-MSC-19526-1] N80-19488
SPACECRAFT CONTAMINATION
Bipropellant engine plume contamination program. Volume 2: Chamber measurements, phase 2
[AD-A077435] N80-19187
Bipropellant engine plume contamination program. Volume 1: Chamber measurements, phase 1
[AD-A078412] N80-19188
NASA standard procedures for the microbiological examination of space hardware
[NASA-TM-80758] N80-19749
SPACECRAFT CONTROL
Large space system control technology overview N80-19162
Large space system control technology status and accomplishments N80-19163
Large space system control technology model order reduction study N80-19164
LaRC controls activity for LSST N80-19165
SPACECRAFT DESIGN
Spacecraft damping considerations in structural design N80-19578
SPACECRAFT ENVIRONMENTS
Rat plasma and tissue lipids after a long-term space flight N80-19773
Functional changes in the adrenal cortex during simulation of stress situations in the presence of high carbon monoxide levels N80-19774
SPACECRAFT MODULES
Erectable/deployable concepts for large space system technology N80-19157
SPACECRAFT POWER SUPPLIES
Large space systems technology electronics: Data and power distribution N80-19168
A linear magnetic motor/generator — to generate electric energy using magnetic flux for spacecraft's power supply
[NASA-CASE-GSC-12518-1] N80-19424
Orbiter fuel cell performance constraints. STS/OPS Pratt Whitney fuel cells. Operating limits for mission planning
[NASA-TM-80968] N80-19610
Advanced technology light weight fuel cell program — orbiting space vehicle long-life hydrogen oxygen fuel cell
[NASA-CR-159807] N80-19615
Solar power satellite system definition study. Volume 1, phase 2: Executive summary
[NASA-CR-160540] N80-19631
SPACECRAFT PROPULSION
Field resonance propulsion concept
[NASA-TM-80961] N80-19184
SPACECRAFT STRUCTURES
Construction alignment sensor feasibility demonstrations (laser measurement) N80-19148
Structural concepts for large spacecraft N80-19156
Large space system control technology overview N80-19162
Effect of structural damping on the dynamic response of spacecraft N80-19577
Damping problems in acoustic fatigue N80-19580
SPATIAL FILTERING
Spatial filtering and mechanisms of perception
[AD-A077622] N80-19788
Background Optical Suppression System (BOSS)
[AD-A077871] N80-19945
SPECIFICATIONS
NSSC-2 operating system design requirements specification
[NASA-CR-161396] N80-19861
SPECTRAL ENERGY DISTRIBUTION
A note on the revised galactic neutron spectrum of the Ames collaborative study
[NASA-CR-150554] N80-20002
SPECTRAL RECONNAISSANCE
Multispectral cloud identification study
[AD-A077873] N80-19710
SPECTRAL REFLECTANCE
Quantitative estimation of plant characteristics using spectral measurement: A survey of the literature
[E80-10078] N80-19587
SPECTRAL SENSITIVITY
Multisensor analysis of hydrologic features in the Wind River Range, Wyoming with emphasis on the SEASAT SAR
[E80-10083] N80-19591
SPECTRAL SIGNATURES
LANDSAT digital analysis of the initial recovery of the Kokolik River tundra fire area, Alaska
[E80-10090] N80-19588
A critical comparison of remote sensing and other methods for nondestructive estimation of standing crop biomass
[E80-10082] N80-19590
Statistical analysis of terrain and water (ice) backgrounds in a winter scene from northern Michigan
[AD-A077554] N80-19598
SPECTROMETERS
Design, construction and testing of a magnetic electron spectrometer for detecting electrons to 10 MeV, including a preliminary design for a flight unit
[AD-A078516] N80-19472
Characterization of LPE grown HgCdTe by ion scattering spectrometry
[AD-A077884] N80-19868
SPECTROSCOPIC ANALYSIS
An improved dispersion system for simultaneous multielement analysis by flame spectroscopy N80-19215
Determination of morphology and electronic structure in solids with 20-1000 eV radiation — techniques of photon absorption and photoemission for spectroscopic analysis of materials
[LBL-9482] N80-19971
SPECTROSCOPY
Ferrographic and spectrographic analysis of oil sampled before and after failure of a jet engine
[NASA-TM-81430] N80-19497
SPECTRUM ANALYSIS
Acoustooptic spectrum analysis and narrowband interference excision in wideband signal environments
[AD-A078286] N80-19325
Integrated optics for rf spectrum analysis and acoustic microscopy for the study of material joints N80-19940
SPECULAR REFLECTION
An application of the photometric stereo method
[AD-A078125] N80-19470
SPHERES
Experimental studies of multiple-scattered light from latex spheres — in rocket exhaust
[AD-A076322] N80-19191
SPHERICAL HARMONICS
The NASA/MSFC global reference atmospheric model: MOD 3 (with spherical harmonic wind model)
[NASA-CR-3256] N80-19704
SPHERICAL SHELLS
Glass shell manufacturing in space — residual gases in spherical shells made from metal-organic gels
[NASA-CR-161408] N80-19141
SPIN
Recent improvements to the spinning body version of the EDDYBL computer program
[NASA-CR-152347] N80-19448
Navier-Stokes solutions for spin-up from rest in a cylindrical container
[AD-A077115] N80-19455
SPLINE FUNCTIONS
A modification of Hudson's technique for piecewise linear regression models N80-19894
SPRAY NOZZLES
Atomization of a liquid by a spray nozzle
[NASA-TM-75771] N80-19447
Monodisperse atomizers for agricultural aviation applications
[NASA-CR-159777] N80-19450
SPRAYERS
Evaluation of a locally homogeneous flow model of spray combustion
[NASA-CR-3202] N80-19283
SPREAD F
The phenomenology of transequatorial radio propagation under spread-F conditions N80-19394
SPREAD SPECTRUM TRANSMISSION
Acoustooptic spectrum analysis and narrowband interference excision in wideband signal environments
[AD-A078286] N80-19325
STABILITY AUGMENTATION
Microprocessor control of low speed V/STOL flight
[AD-A077661] N80-19129
STABILITY DERIVATIVES
Practical input signal design — For identifying stability and control derivatives N80-19097
STAINLESS STEELS
In vivo and in vitro aging of plasma-sprayed alumina on 316L stainless steel and TI6AL-4V ELI substrates — prosthetic devices N80-19231
Method of forming dynamic membrane on stainless steel support
[NASA-CASE-MSC-19172-1] N80-19237
ISS-SIMS surface characterization of smut on stainless steel
[AD-A078122] N80-19238
Stress corrosion of stainless steels, volume 2. Citations from the Engineering Index data base
[PB80-803208] N80-19257
Stress corrosion of stainless steels, volume 2. Citations from the NTIS data base
[PB80-803190] N80-19258
Comparison of the tribological properties at 25 C of seven different polyimide films bonded to 301 stainless steel
[NASA-TM-81413] N80-19263
STANDARDIZATION
Journal of Research of the National Bureau of Standards, volume 84, no. 5 — results of research in physical and engineering sciences with emphasis on measurement and standardization
[PB80-103674] N80-20022
STANDARDS
Reliability clauses in contracts N80-19528
The increase of the reliability of electronic equipment subject to reliability clauses N80-19529
Reliability improvement due to the application of clauses of operational reliability N80-19530
Journal of Research of the National Bureau of Standards, volume 84, no. 5 — results of research in physical and engineering sciences with emphasis on measurement and standardization
[PB80-103674] N80-20022
STAR CLUSTERS
On the continuing stellar formation in the central regions of some globular clusters and their relation to the pulsars
[NASA-TM-75703] N80-19996
STATIC TESTS
The history of static test and Air Force structures testing
[AD-A077029] N80-19136
STATIONS
Effects of tunnel and station size on the costs and service of subway transit systems
[UMTA-CA-06-0116-79-3] N80-19989
STATISTICAL ANALYSIS
Ku-band radar threshold analysis
[NASA-CR-160557] N80-19322
Statistical analysis of terrain and water (ice) backgrounds in a winter scene from northern Michigan
[AD-A077554] N80-19598
Statistical analysis of terrain and water backgrounds in the vicinity of Port Huanseme, California
[AD-A077025] N80-19599
Randomization tests in support of some statistical analyses of a weather modification experiment
[AD-A076336] N80-19736
An introduction to statistical analysis of simulation output data N80-19811
On the problems of construction and statistical inference associated with a generalization of canonical variables N80-19895
On the asymptotic distribution of U-statistics
[AD-A078117] N80-19919
STATISTICAL CORRELATION
Extensions of the Box-Cox transformation to grouped-data situations N80-19913
STATISTICAL DISTRIBUTIONS
Theoretical distribution functions of multipath propagation and their parameters for mobile radio communication in quasi-smooth terrain N80-19358

Fast estimation of three parameters of Weibull law N80-19526

A density-quantile function approach to choosing order statistics for the estimation of location and scale parameters N80-19915

STATISTICAL WEATHER FORECASTING

Some models for ceiling
[AD-A078033] N80-19707

Some models for windspeed
[AD-A077048] N80-19722

STEAM TURBINES

Waste heat recovery unit design for gas turbine propulsion systems
[AD-A078154] N80-19503

STEELS

Fatigue strength of trip steels
[AD-A078582] N80-19245

Energy conservation in the U.S. economy from increased recycle of obsolete steel scrap N80-19492

Establishment of engineering design data for hybrid steel/ceramic ball bearings
[AD-A078804] N80-19509

STELLAR EVOLUTION

On the continuing stellar formation in the central regions of some globular clusters and their relation to the pulsars
[NASA-TM-75703] N80-19998

STELLARATORS

Confinement and heating of hot plasmas in a hybrid system of Tokamak and stellarator
[ISSN-0547-1567] N80-19953

STEREOPHOTOGRAPHY

The pointable multispectral linear array system and the large format camera for early 1980 shuttle payloads N80-20015

STEREOSCOPY

An application of the photometric stereo method
[AD-A078125] N80-19470

STIFFENING

Figure-of-merit for bare and coated wires and flat ribbon jumpers
[BDX-613-2304] N80-19445

STIRLING CYCLE

Solar powered liquid piston Stirling cycle irrigation pump
[SAN/1894-1] N80-19641

STOCHASTIC PROCESSES

Multistate reliability models and some extensions of a univariate shock model N80-19513

On the weak convergence of a sequence of general stochastic difference equations to a diffusion
[AD-A080082] N80-19903

A stochastic realization approach to the smoothing problem. Revised — linear systems
[AD-A078137] N80-19917

STORAGE BATTERIES

Development of a Fe-Pb(Tl) secondary battery system N80-19608

Lithium battery storage and discharge tests
[SAND-79-0869C] N80-19643

STOWAGE (ONBOARD EQUIPMENT)

Advanced sunflower antenna concept development — stowable reflectors N80-19147

STRATA

Fields from a vertical magnetic dipole
[SAND-79-0449] N80-19695

STRATOSPHERE

Orbit dynamics and geographical coverage capabilities of satellite-based solar occultation experiments for global monitoring of stratospheric constituents
[NASA-TP-1806] N80-19142

Calculations using a model, of the seasonal variation in the concentration of nitrogen compounds in the temperate stratosphere
[BLL-TRANS-1400-(9022.549)] N80-19700

STRESS (BIOLOGY)

Quantitative estimation of plant characteristics using spectral measurement: A survey of the literature
[EB0-10078] N80-19587

STRESS (PHYSIOLOGY)

Effect of habituation on the susceptibility of the rat to restraint ulcers
[NASA-TM-76072] N80-19748

Effect of grafted physical load on the state of the liver from morphometric data and biochemical blood indices of rats against a background of hypokinesia
[NASA-TM-75969] N80-19750

Effectiveness of using thyrocalcitonin for the prevention of a calcium metabolic disorder in the mineralized tissues of rabbits with 30 days hypokinesia
[NASA-TM-75987] N80-19751

Dynamics of erythrocyte count, hemoglobin, and catalase activity in rat blood in hypokinesia, muscular activity and restoration
[NASA-TM-76058] N80-19752

State of the mineral component of rat bone tissue during hypokinesia and the recovery period
[NASA-TM-76059] N80-19753

Reaction of chickens to graduated length of exposure to stress
[NASA-TM-76071] N80-19754

Reaction of human blood to chronic exposure to low doses of carbon monoxide in a confined environment N80-19761

Effect of hyperoxia on oxygen transport properties of blood N80-19763

External respiration and acid-base balance of human blood during long-term antiorthostatic hypokinesia and in the recovery period N80-19764

Distinctions in development of pyrogenal fever in animals following prolonged hypokinesia N80-19765

Dynamics of stress reaction of rats during experimental hypokinesia varying in duration, and possibility of correction thereof N80-19771

Effect of brief antiorthostatic hypokinesia on blood immunoglobulin content N80-19772

Functional changes in the adrenal cortex during simulation of stress situations in the presence of high carbon monoxide levels N80-19774

Alimentary hypokinesia
[NASA-TM-75989] N80-19784

Metabolism during hypodynamia
[NASA-TM-75996] N80-19785

Blood circulation under conditions of weightlessness
[NASA-TM-76036] N80-19786

Certain questions of the acclimatization of construction workers to the conditions of a subtropical climate
[NASA-TM-75728] N80-19787

Stress factors on pilot performance. A bibliography with abstracts
[PB80-803075] N80-19794

STRESS (PSYCHOLOGY)

Evaluation and forecasting of mental fitness of flight personnel in the presence of neurosis N80-19770

STRESS ANALYSIS

Structural analysis of hollow blades: Torsional stress analysis of hollow fan blades for aircraft jet engines
[NASA-TM-75718] N80-19111

Characteristics of mechanically fastened joints of CIP/HIP-1 Beryllium
[AD-A078275] N80-19500

An approximate finite-element method of stress analysis of non-axisymmetric bodies with elastic-plastic material behavior N80-19562

Theory of twisted nonuniformly heated bars
[NASA-TM-75758] N80-19565

An analysis of residual stresses and displacements due to radial expansion of fastener holes
[AD-A078370] N80-19569

Stress analysis of high-level waste canisters: Methods, applications, and design data
[PNL-3036] N80-19939

STRESS CONCENTRATION

Determination of test technique influence on K sub ISCC values for aluminum 7075-T651
[AD-A077453] N80-19242

Indirect deformation (strain) measurements and calibrations in Sandia triaxial apparatus for rock testing to 250 C
[SAND-79-0114] N80-19696

STRESS CORROSION

Passive films, surface structure and stress corrosion and crevice corrosion susceptibility
[AD-A078596] N80-19243

Stress corrosion of stainless steels, volume 2. Citations from the Engineering Index data base
[PB80-803208] N80-19257

Stress corrosion of stainless steels, volume 2. Citations from the NTIS data base
[PB80-803190] N80-19258

STRESS CORROSION CRACKING

Determination of test technique influence on K sub ISCC values for aluminum 7075-T651
[AD-A077453] N80-19242

STRESS RATIO

Fatigue strength of trip steels
[AD-A078582] N80-19245

STRESS RELAXATION

State of the mineral component of rat bone tissue during hypokinesia and the recovery period
[NASA-TM-76059] N80-19753

STRUCTURAL ANALYSIS

Structural analysis of hollow blades: Torsional stress analysis of hollow fan blades for aircraft jet engines
[NASA-TM-75718] N80-19111

The history of static test and Air Force structures testing
[AD-A077029] N80-19136

Investigation of weld pool structure and property control in pulsed arc welding
[AD-A078222] N80-19501

Damping Effects in Aerospace Structures
[AGARD-CP-277] N80-19572

Mathematical formulation of damping for structural response analysis N80-19573

Numerical modelling of structures to account for internal damping N80-19575

A comparative analysis of Rawinsonde and Nimbus-6 and Tiros-N satellite profile data
[AD-A079295] N80-19737

The determination of atmospheric structure from quantitative satellite data
[AD-A078980] N80-19738

STRUCTURAL BASINS

Multisensor analysis of hydrologic features in the Wind River Range, Wyoming with emphasis on the SEASAT SAR
[EB0-10083] N80-19591

STRUCTURAL DESIGN

Design considerations for attaining 250-knot test velocities at the aircraft landing dynamics facility
[NASA-TM-80222] N80-19132

The geometry of the 37-tile microwave antenna support structure
[NASA-CR-162847] N80-19321

Magnetohydrodynamic (MHD) magnet modeling
[AD-A078865] N80-19443

Spacecraft damping considerations in structural design N80-19578

Low cost point focus solar concentrator. Phase 1: Preliminary design
[JPL-9950-273] N80-19622

Low-costs point-focus solar concentrator, phase 1
[NASA-CR-162939] N80-19625

STRUCTURAL DESIGN CRITERIA

Spacecraft damping considerations in structural design N80-19578

STRUCTURAL FAILURE

Damping problems in acoustic fatigue N80-19580

STRUCTURAL PROPERTIES (GEOLOGY)

Radar altimeter measurements N80-19368

Definition of subsurface features by geophysical probing N80-19408

STRUCTURAL RELIABILITY

Research on nondestructive testing
[AD-A078483] N80-19517

STRUCTURAL STRAIN

Evaluation of SRM flex bearing materials and processes
[NASA-TM-78266] N80-19264

STRUCTURAL VIBRATION

Hydroelastic vibration analysis of partially liquid-filled shells using a series representation of the liquid
[NASA-TP-1558] N80-19563

Damping Effects in Aerospace Structures
[AGARD-CP-277] N80-19572

Numerical modelling of structures to account for internal damping N80-19575

Vibration damping on San Marco satellites; results and comments N80-19579

Report on the use of abatement techniques for problems related to vibrations and noise N80-19583

SUBMARINES

Strategic blue-green optical communications program plan. Investment strategy toward an optical solution for satellite-to-submarine information transfer
[AD-A078345] N80-19344

SUBMILLIMETER WAVES
Submillimeter wave spectroscopy and technology — optically-pumped laser spectroscopy
[AD-A078003] N80-19222
SUBROUTINES
Easy ACLS dynamic analysis, volume 2. Part 2: Component computer programs
[AD-A079803] N80-19076
SUBSONIC FLOW
Visualization of unsteady jets and aerodynamic noise fields
[CUED/A-TURBO/TR-96] N80-19029
Far field conditions for subsonic flows with small superimposed harmonic oscillations
[AD-A077693] N80-19043
Analytic and numerical investigation of the convergence for the adaptive-wall concept
[AD-A078203] N80-19134
SULFUR COMPOUNDS
Stability to heat treatment of nickel-manganese deposits containing sulphur
[BLL-RTS-11581] N80-19234
SULFUR DIOXIDES
Coal processing fuel cell utilization. Task 8: H2S removal by calcium-based sorbents
[PSI-TR-167] N80-19300
SULFURIC ACID
Evaluation of methodology and prototype to measure atmospheric sulfuric acid
[PB80-107055] N80-19669
SUPERCHARGERS
Experimental investigation into the heat flux in the piston and cylinder liner of a high-speed diesel engine
[BLL-RTS-11902] N80-19494
SUPERCONDUCTING MAGNETS
Magnetohydrodynamic (MHD) magnet modeling
[AD-A078865] N80-19443
SUPERCONDUCTIVITY
Nonequilibrium phenomena in superconducting phase-slip centers
[AD-A078441] N80-19442
SUPERCONDUCTORS
Detection of a normal zone in inductively coupled superconducting coils
[UCRL-83307] N80-19446
Josephson junctions. Citations from the NTIS data base
[PB80-802655] N80-19975
Josephson junctions, volume 2. Citations from the Engineering Index data base
[PB80-802663] N80-19976
SUPERHIGH FREQUENCIES
Ku-band radar threshold analysis
[NASA-CR-160557] N80-19322
S-BAND MIC TRAPATT amplifier
[BLL-RTS-11884] N80-19420
Critique of a Hughes shuttle Ku-band data sampler/bit synchronizer
[NASA-CR-160556] N80-19427
SUPERSATURATION
Prospects for broadening the range of inorganic binding agents
[RTS-11804] N80-19216
SUPERSONIC FLIGHT
Evaluation of aircraft windshield materials in a simulated supersonic flight environment
[AD-A078673] N80-19082
GE-SI supersonic FLIR window
[AD-A078371] N80-19948
SUPERSONIC FLOW
Application of a numerically generated orthogonal coordinate system to the solution of inviscid axisymmetric supersonic flow over blunt bodies
[NASA-TP-1619] N80-19031
SURFACE ACOUSTIC WAVE DEVICES
Surface Acoustic Waves: Experimental device fabrication
[BBC-RD-1979/29] N80-19928
SURFACE FINISHING
Formation of porous films on titanium alloys by anodization treatments
[AD-A077676] N80-19244
Automated array assembly task in-depth study of silicon wafer surface texturizing
[NASA-CR-162883] N80-19618
SURFACE GEOMETRY
Workshop on Aircraft Surface Representation for Aerodynamic Computation
[NASA-TM-81170] N80-19025
SURFACE PROPERTIES
ISS-SIMS surface characterization of amut on stainless steel
[AD-A078122] N80-19238
Passive films, surface structure and stress corrosion and crevice corrosion susceptibility
[AD-A078596] N80-19243
On the influence of surface statistics, ground moisture content and wave polarization on the scattering of irregular terrain and on signal power spectra N80-19359
SURFACE REACTIONS
The oxidation of graphitic monolayers on Ni(110)
[AD-A078512] N80-19210
Surface treatment for aluminum bonding
[AD-A078950] N80-19254
Surface chemical composition - depth profile of polyether polyurethaneureas as studied by FT-IR and ESCA
[AD-A078240] N80-19272
Development of surface interactions at polymer-metal interfaces
[AD-A077276] N80-19280
Solid state, surface and catalytic properties of oxides
[COO-4987-1] N80-19974
SURFACE ROUGHNESS
Scattered radiation fields from rough surfaces full wave solutions N80-19356
Influence of roughness and blowing on compressible turbulent boundary layer flow — skin friction drag
[AD-A077642] N80-19481
SURFACE TEMPERATURE
Sea surface temperature of the coastal zones of France. Heat Capacity Mapping Mission (HCMM)
[E80-10057] N80-19585
SURFACE TO SURFACE MISSILES
Harpoon pyrotechnic shock study
[AD-A078727] N80-19175
SURFACE VEHICLES
Risk assessment of carbon fiber composite in surface transportation N80-19005
SURFACE WAVES
An experimental study of surface wave propagation on a low permittivity medium N80-19353
Body and surface wave modeling of observed seismic events
[AD-A079056] N80-19694
SWITCHES
Development of mathematical models for solid state switching devices
[NASA-CR-161387] N80-19426
SWITCHING CIRCUITS
Solid state power controller verification studies
[AD-A078238] N80-19429
SYNCHRONOUS MOTORS
Minature synchronous motors with permanent magnet rotors
[BLL-RTS-11801] N80-19423
SYNCHROTRON RADIATION
Investigation of higher order forbidden reflections in Si and Ge using synchrotron radiation N80-19963
SYNOPTIC METEOROLOGY
Analyze, calculate, and develop techniques for weather satellite imagery data
[AD-A077292] N80-19735
SYNTAX
The levels of edit, second edition
[NASA-CR-162880] N80-19963
SYNTHETIC APERTURE RADAR
Synthetic aperture imaging techniques at short wavelengths
[AD-A078720] N80-19336
SYNTHETIC FUELS
Methanol and methyl fuel catalysts
[FE-3177-4] N80-19302
Synthesis gas demonstration plant program, phase 1
[FE-257706] N80-19308
Pollutants from synthetic fuels production: Sampling and analysis methods for coal gasification
[PB80-104856] N80-19309
SYSTEMS ANALYSIS
Application of the Estimation-Before-Modeling (EBM) system identification method to the high angle of attack/sideslip flight of the T-2C jet trainer aircraft. Volume 2: Simulation study using T-2C wind tunnel model data
[AD-A079923] N80-19061
Application of the Estimation-Before-Modeling (EBM) system identification method to the high angle of attack/sideslip flight of the T-2C jet trainer aircraft. Volume 3: Identification of T-2C aerodynamics stability and control characteristics from actual flight test data
[AD-A079924] N80-19072
Application of the Estimation-Before-modeling (EBM) system identification method to the high angle of attack/sideslip flight of the T-2C jet trainer aircraft. Volume 1: Executive summary
[AD-A080025] N80-19073
An analysis and synthesis of engine condition monitoring systems
[AD-A077531] N80-19122
Laser vibration gyroscope
[BLL-RTS-11579] N80-19467
Reliability and support data for statistical evaluation — using a management information system N80-19559
Simulation of a night vision system for low level helicopter operations — using helmet mounted display device N80-19832
The Mitre Interactive Communications Analysis Program (MICAP) N80-19835
Avionics evaluation program: Simulation models for the effectiveness analysis of avionics N80-19838
Using assertions for adaptive testing of software
[AD-A077396] N80-19875
Nonlinear systems with Gaussian inputs: Representation, identification and inverse problems
[AD-A078587] N80-19900
SYSTEMS ENGINEERING
Prototype development passive, seat-mounted limb retention system
[AD-A078031] N80-19053
Tests of an improved rotating stall control system on a J-85 turbojet engine
[AD-A077704] N80-19109
Trends in reliability modeling technology for fault tolerant systems N80-19534
Nonelectronic aspects of avionic system reliability — actuation N80-19535
The importance of integrated logistics support considerations during design N80-19557
Design and simulation of a C3 system for surveillance purpose N80-19821
The application of modeling and simulation to the development of the E-3A N80-19823
Design of a simulator for studying the helicopter - SDVEH N80-19829
Computer aided evolutionary design for software engineering
[AD-A078060] N80-19868

T

T-2 AIRCRAFT
Application of the Estimation-Before-Modeling (EBM) system identification method to the high angle of attack/sideslip flight of the T-2C jet trainer aircraft. Volume 2: Simulation study using T-2C wind tunnel model data
[AD-A079823] N80-19061
Application of the Estimation-Before-Modeling (EBM) system identification method to the high angle of attack/sideslip flight of the T-2C jet trainer aircraft. Volume 3: Identification of T-2C aerodynamics stability and control characteristics from actual flight test data
[AD-A079924] N80-19072
Application of the Estimation-Before-modeling (EBM) system identification method to the high angle of attack/sideslip flight of the T-2C jet trainer aircraft. Volume 1: Executive summary
[AD-A080025] N80-19073
TARGET ACQUISITION
Intelligent tracking techniques — for FLIR and TV imagery
[AD-A077869] N80-19943
TARGET RECOGNITION
Helicopter pilot detection of the two different camouflaged hawk batteries
[AD-A077954] N80-19803
TAXIING
Development of a normalized probability distribution for lateral load factors due to aircraft ground turning
[AD-A077047] N80-19070

TECHNICAL WRITING
The levels of edit, second edition
[NASA-CR-162980] N80-19983

TECHNOLOGICAL FORECASTING
Measuring technological change in jet fighter aircraft
[AD-A077380] N80-19084
Energy from the west: Impact analysis report. Volume 2. Site-specific and regional impact analyses
[PB80-113574] N80-19655
History and future of remote sensing technology and education N80-20004
Air Force Flight Dynamics Laboratory fiscal year 1981. Technical objective document
[AD-A078873] N80-20020

TECHNOLOGY ASSESSMENT
Large space system control technology overview N80-19162
Large space system control technology status and accomplishments N80-19163
Flexible materials technology N80-19171
Primary Adhesively Bonded Structure Technology (PABST). General material property data — bonding surfaces
[AD-A077891] N80-19298
Recent advances in HF propagation simulation N80-19392
History and future of remote sensing technology and education N80-20004

TECHNOLOGY TRANSFER
Electrolysis-based hydrogen storage systems overview and rationale of the Brookhaven National Laboratory managed program
[BNL-28904] N80-19654
Conference of Remote Sensing Educators (CORSE-78)
[NASA-CP-2102] N80-20003
Is remote sensing far out? N80-20005
NASA programs in technology transfer and their relation to remote sensing education N80-20009
Opportunities and problems in introducing or expanding the teaching of remote sensing in universities N80-20011

TECHNOLOGY UTILIZATION
New technology to improve HF circuit reliability and availability for remote regions N80-19417
Computer applications — agriculture
[LA-7944-PR] N80-19654
NASA's western regional applications training activity N80-20010

TEETERING
Teetered, tip-controlled rotor: Preliminary test results from Mod-0 100-kW experimental wind turbine
[NASA-TM-81445] N80-19613

TELECOMMUNICATION
Simulation program of nonlinearities applied to telecommunication systems
[NASA-TM-75511] N80-19320
Computerized models for design and analysis of computer communications systems
[AD-A078022] N80-19324
Leaky coaxial cables for obstacle detection and continuous access guided communications N80-19407
Comparison of loop and dipole antennas in leaky feeder communication systems N80-19412
Mode conversion by tunnel non-uniformities in leaky feeder communication systems N80-19413

TELEOPERATORS
Toward a remotely-manned energy and production economy
[AD-A078069] N80-19804

TEMPERATURE
Equilibrium temperatures in self-contained bearing assemblies. Part 5: Examples of the complete method — method of estimating the temperature rise in a bearing assembly
[ESDU-79002] N80-19493
Magnetic moment versus temperature curves of rare-earth iron garnets
[AD-A077356] N80-19970

TEMPERATURE EFFECTS
Characteristics of mechanically fastened joints of CIP/HIP-1 Beryllium
[AD-A078275] N80-19500
Transient thermal effects in disc brakes
[AD-A078735] N80-19505

TEMPERATURE MEASUREMENT
Thermocouple, multiple junction reference oven
[NASA-CASE-FRC-10112-1] N80-19489
Transient thermal effects in disc brakes
[AD-A078735] N80-19505

TENSILE STRENGTH
Fatigue strength of trip steels
[AD-A078582] N80-19345

TENSILE TESTS
The effect of test system misalignment in the dynamic tension test
[NASA-CR-162829] N80-19584

TERNARY ALLOYS
The liquidus surface of the aluminum-titanium-boron phase diagram at the aluminum corner
[BLL-RTS-11685] N80-19235

TERRAIN
Terrain profiles and contours in electromagnetic wave propagation
[AGARD-CP-269] N80-19345
Theories of ground wave propagation over mixed paths N80-19350
Ground wave propagation over irregular, inhomogeneous terrain: Comparisons of calculations and measurements at frequencies from 121 kHz to 50 mHz N80-19352
On the influence of surface statistics, ground moisture content and wave polarization on the scattering of irregular terrain and on signal power spectra N80-19359
Biological and geophysical factors of electromagnetic wave propagation and their use in digital data banks N80-19363
Radio network and radio link surveys derived by computer from a terrain data base N80-19365
VHF/UHF path-loss calculations using terrain profiles deduced from a digital topographic data base N80-19366
Statistical analysis of terrain and water backgrounds in the vicinity of Port Hueneme, California
[AD-A077025] N80-19599

TERRAIN ANALYSIS
Theoretical modelling and experimental data matching for active and passive microwave remote sensing of Earth terrain N80-19360
Some of the problems in digital terrain model construction N80-19361
Azimuth beamwidth effect on radar sensed terrain horizon profiles N80-19362

TERRESTRIAL RADIATION
Statistical analysis of terrain and water (ice) backgrounds in a winter scene from northern Michigan
[AD-A077554] N80-19598

TEST CHAMBERS
Climatic chamber tests of a surface ice accretion measurement system
[AD-A077022] N80-19725

TEST EQUIPMENT
Computer simulation model of the logistic support system for electrical engineering test equipment N80-19560

TEST FACILITIES
Crew station design facility feasibility study
[AD-A078134] N80-19064
Laser-Raman flow-field diagnostics of two large hypersonic test facilities
[AD-A078289] N80-19135

TEST STANDS
The effect of test system misalignment in the dynamic tension test
[NASA-CR-162829] N80-19584

TEXTBOOKS
Textbooks and technical references for remote sensing N80-20014

TEXTURES
Automated array assembly task in-depth study of silicon wafer surface texturizing
[NASA-CR-162880] N80-19618

THEMATIC MAPPING
Multisensor analysis of hydrologic features in the Wind River Range, Wyoming with emphasis on the SEASAT SAR
[E80-10083] N80-19591

THEOREM PROVING
Generalizations of compactness and cardinal invariants of spaces N80-19925

THEORETICAL PHYSICS
Reintroducing the concept of force into relativity theory
[ORO-3992-367] N80-19977

THERMAL STABILITY
Stability to heat treatment of nickel-manganese deposits containing sulphur
[BLL-RTS-11591] N80-19234

THERMOCHEMISTRY
Thermochemical processes for hydrogen production
[LA-7937-PR] N80-19299

THERMOCOUPLES
Thermocouple, multiple junction reference oven
[NASA-CASE-FRC-10112-1] N80-19489

THERMODYNAMIC EFFICIENCY
Thermal performance evaluation of the Northrop model NSC-01-0732 concentrating solar collector array at outdoor conditions — Marshall Space Flight Center solar house test facility
[NASA-CR-161354] N80-19629
Algorithm for calculating turbine cooling flow and the resulting decrease in turbine efficiency
[NASA-TM-81453] N80-19883

THERMODYNAMICS
The crystallization thermodynamics of piezoelectric copolymers
[AD-A078705] N80-19276
One-sided continuous dependence of maximal solutions — Carathéodory condition
[AD-A079722] N80-19906

THERMOELASTICITY
Investigation of thermoplastic elastomers as propellant binders
[AD-A078691] N80-19298

THERMOELECTRIC POWER GENERATION
A 15 kWe (nominal) solar thermal-electric power conversion concept definition study: Steam Rankin reciprocator system
[NASA-CR-159591] N80-19612
Annual technical report, fiscal year 1979. Volume 1: Executive summary
[NASA-CR-159715] N80-19632
The effects of regional insolation differences upon advanced solar thermal electric power plant performance and energy costs
[NASA-CR-162886] N80-19634
Screening evaluation of electric power cycles integrated with coal gasification plants
[EPRI-AF-1160] N80-19646

THERMOSPHERE
Ionospheric effects of a solar eclipse in the Cape Verde Islands N80-19399

THETA PINCH
Normal ionizing shock as a theta pinch preionizer
[LA-8064-MS] N80-19960

THICK FILMS
Development of economical improved thick film solar cell contact
[NASA-CR-162849] N80-19619

THIN FILMS
Practical electroplating properties of electrochemically deposited metal and alloy coatings. Part 1: Gold and gold alloys
[BLL-TRS-11923] N80-19233
Method of forming dynamic membrane on stainless steel support
[NASA-CASE-MSC-18172-1] N80-19237
Program to design, develope, fabricate and deliver thin film chip inductors suitable for hybrid circuit applications
[AD-A078640] N80-19432
Automated array assembly task in-depth study of silicon wafer surface texturizing
[NASA-CR-162880] N80-19618
Crystal growth and phase stability of metastable indium antimonide bismide thin films N80-19665

THIOLS
Kinetics and mechanism of desulfurization and denitrogenation of coal-derived liquids — quinoline, indole, dibenzothiophene, and naphthalene
[FE-2028-15] N80-19292

THREE DIMENSIONAL BOUNDARY LAYER
Recent improvements to the spinning body version of the EDDYBL computer program
[NASA-CR-152347] N80-19448

THREE DIMENSIONAL FLOW
Aerodynamic and acoustic investigations of axial flow fan and compressor blade rows, including three-dimensional effects
[AD-A077712] N80-19116

THRUST BEARINGS
Thrust, sleeve and jewel bearings, volume 2. Citations from the Engineering Index data base — bibliographies
[PB80-802830] N80-19511
Thrust, sleeve and jewel bearings. Citations from the NTIS data base — bibliographies
[PB80-802822] N80-19512

THRUST REVERSAL
Minimum time turns with thrust reversal — using control theory
[AD-A079851] N80-19078

THRUST VECTOR CONTROL
Thrust vectoring to eliminate the vertical stabilizer — to provide directional stability for f-111 aircraft while decreasing radar detectability
[AD-A079952] N80-19077

THRUST-WEIGHT RATIO
Preliminary study of VTO thrust requirements for a V/STOL aircraft with lift plus lift/cruise propulsion
[NASA-TM-81429] N80-19110

THUNDERSTORMS
A mobile HF impulse source locator — thunderstorm location and tracking N80-19414
An investigation of radar returns and their relationship to severe weather occurrences — the use of meteorological radar and radar signatures to predict thunderstorms
[AD-A078858] N80-19714

THYRATRONS
Plasma cathode thyratron
[AD-A078864] N80-19431

TILES
The geometry of the 37-tile microwave antenna support structure
[NASA-CR-162847] N80-19321

TIMBER INVENTORY
Use of remote sensing for land use policy formulation — Kalamazoo, Lake, Mecosta, Newaygo, Osceola, and Wexford counties, Michigan
[E80-10085] N80-19592

TIMBER VIGOR
Remote sensing applications to resource problems in South Dakota — Chamberlain, Rapid City; Watertown; Spink County; Lake Herman and Six-Mile Creek Watersheds; and Missouri River waterfowl
[E80-10066] N80-19593

TIME DEPENDENCE
Representation of time dependent mechanical behavior of rene 95 by constitutive equations
[AD-A077271] N80-19250

TIME DIVISION MULTIPLE ACCESS
A JTIDS performance model for the E-3A N80-19825

TIME MEASUREMENT
Recovery system preliminary design. A simplified approach to determining staging, timing and altitude requirements for fast inflating parachutes
[AD-A077548] N80-19041

TIN
A new method of metallization for silicon solar cells
[NASA-CR-162823] N80-19620

TIROS N SATELLITE
A comparative analysis of Rawinsonde and Nimbus-6 and Tiros-N satellite profile data
[AD-A079295] N80-19737

TISSUES (BIOLOGY)
Rat plasma and tissue lipids after a long-term space flight N80-19773
Kidney cell electrophoresis
[NASA-CR-160555] N80-19782

TITANIUM
Gas phase hydrogen permeation in alpha titanium and carbon steels
[NASA-CR-3190] N80-19236

TITANIUM ALLOYS
The liquidus surface of the aluminum-titanium-boron phase diagram at the aluminum corner
[BLL-RTS-11695] N80-19235
Consolidation of titanium powder to near net shapes
[AD-A078039] N80-19239
Formation of porous films on titanium alloys by anodization treatments
[AD-A077676] N80-19244
Exploratory development of die materials for isothermal forging of titanium alloys
[AD-A078951] N80-19249

TOKAMAK DEVICES
Confinement and heating of hot plasmas in a hybrid system of Tokamak and stellarator
[ISSN-0547-1567] N80-19953

TOLERANCES (MECHANICS)
USAF damage tolerant design handbook: Guidelines for the analysis and design of damage tolerant aircraft structures, revision A
[AD-A078216] N80-19065

TOPOGRAPHY
A laser profilometer for digital terrain mapping N80-19369
Multisensor analysis of hydrologic features in the Wind River Range, Wyoming with emphasis on the SEASAT SAR
[E80-10083] N80-19591
Representation of hydrographic surveys and ocean bottom topography by analytical models
[AD-A078282] N80-19748

TOPOLOGY
On the weak law of large numbers D(0,1)
[AD-A078130] N80-19826

TOROIDAL PLASMAS
Confinement and heating of hot plasmas in a hybrid system of Tokamak and stellarator
[ISSN-0547-1567] N80-19953

TORSIONAL STRESS
Structural analysis of hollow blades: Torsional stress analysis of hollow fan blades for aircraft jet engines
[NASA-TM-75718] N80-19111

TOWERS
The effects of re-radiation from high-rise buildings and transmission lines upon the radiation pattern of MF broadcasting antenna arrays N80-19347

TOXIC HAZARDS
A biological waste water monitor study using differential laser light scattering from bacteria
[AD-A078527] N80-19665

TOXICOLOGY
Reaction of human blood to chronic exposure to low doses of carbon monoxide in a confined environment N80-19761
Probability of altitude decompression disorders when breathing oxygen containing human waste gases N80-19762

TRACKING (POSITION)
Solar-powered sun tracker
[AD-A078653] N80-19640

TRACKING NETWORKS
Design and simulation of a C3 system for surveillance purpose N80-19821

TRACKING RADAR
Experimental measurements of ground reflection elevation multipath characteristics and its effects on a small aperture elevation tracking radar
[AD-A077915] N80-19327

TRAFFIC
Low-cost bus-tunnels to the central business district
[UMTA-CA-06-0116-79-1] N80-19990

TRAILING EDGES
Viscous flow in the region of a rounded trailing edge
[AD-A078588] N80-19045

TRAINING DEVICES
Aviation training using video disk technology N80-19828
Cost-effectiveness of flight simulators for military training N80-19830
The use of multimedia and programmed teaching machines for remote sensing education N80-20012

TRAINING EVALUATION
Simulation within military defence systems for training and evaluation N80-19819

TRAINING SIMULATORS
A mission training simulator for the Nimrod MR MK 2 and some aspects of the derivation and verification of its system models N80-19826

TRAJECTORY ANALYSIS
Analysis of fuel-conservative curved decelerating approach trajectories for powered-lift and CTOL jet aircraft
[NASA-TP-1650] N80-19022

TRAJECTORY OPTIMIZATION
Trajectories optimization in hypersonic flight
[NASA-CR-162848] N80-19026

TRANSDUCERS
The effect of seawater on polymers
[AD-A077324] N80-19291

TRANSEQUATORIAL PROPAGATION
Transequatorial propagation through equatorial plasma bubbles: Discrete events N80-19393
The phenomenology of transequatorial radio propagation under spread-F conditions N80-19394

TRANSFER FUNCTIONS
Digital computer solution of aircraft longitudinal and lateral directional dynamic characteristics
[AD-A078672] N80-19068

TRANSFER OF TRAINING
Is remote sensing for out? N80-20005
The attributes of a well-trained remote sensing technologist N80-20006
A multidisciplinary approach to remote sensing education N80-20007
NASA's western regional applications training activity N80-20010

TRANSFER TUNNELS
Mode converters for HF tunnels transmission N80-19406
Effective use of natural modes in VHF and UHF tunnel propagation N80-19411

TRANSFORMATIONS (MATHEMATICS)
Landsat MSS coordinate transformations — determining satellite orbits
[AD-A078418] N80-19596
Extensions of the Box-Cox transformation to grouped-data situations N80-19913
Nonlinear wave evolution in VLASOV plasma: A lie-transform analysis
[LBL-8185] N80-19962

TRANSITION METALS
Hydrogen in HY-130 weld metal
[AD-A077574] N80-19508

TRANSLATING
Metrics of software quality
[AD-A077896] N80-19869

TRANSMISSION EFFICIENCY
Special topics in HF propagation
[AGARD-CP-263] N80-19372
Assessment of HF communications reliability N80-19377

TRANSMISSION LINES
The effects of re-radiation from high-rise buildings and transmission lines upon the radiation pattern of MF broadcasting antenna arrays N80-19347
Principles of HF communication in tunnels using open transmission lines and leaky cables N80-19405

TRANSMISSION LOSS
VHF/UHF path-loss calculations using terrain profiles deduced from a digital topographic data base N80-19388

TRANSMITTERS
A new computer-controlled High Frequency direction-finding and transmitter locating system N80-19415

TRANSONIC WIND TUNNELS
A theoretical analysis of simulated transonic boundary layers in cryogenic-nitrogen wind tunnels
[NASA-TP-1631] N80-19131
Toward new transonic windtunnels
[AGARD-AG-240] N80-19137
An investigation of the quality of the flow generated by three types of wind tunnel (Ludwieg tube, Evans clean tunnel and injector driven tunnel) N80-19138
Development of the cryogenic tunnel concept and application to the US National Transonic Facility N80-19139
The cryogenic wind tunnel: another option for the European Transonic Facility N80-19140

TRANSPORT AIRCRAFT
Propulsion and energetics panel Working Group 11 on aircraft fire safety. Volume 2: Main report
[AGARD-AR-132-VOL-2] N80-19047

TRANSPORT PROPERTIES
Hydrogen entry and transport mechanisms in structural metals
[AD-A078812] N80-19248

TRANSPORTATION
Risk assessment of carbon fiber composite in surface transportation N80-19205

TRANSPORTATION ENERGY
Methanol as a transportation fuel: Assessment of environmental and health research
[UCRL-52897] N80-19295
TRANSVERSE OSCILLATION
Transverse oscillations of smooth and rough cylinders in harmonic flow
[AD-A078271] N80-19034
TRANSVERSE WAVES
Transverse oscillations of smooth and rough cylinders in harmonic flow
[AD-A078271] N80-19034
TRAPATT DEVICES
S-BAND MIC TRAPATT amplifier
[BLL-RTS-11884] N80-19430
TRAVELING WAVE TUBES
Coupled cavity traveling wave tube with velocity tapering
[NASA-CASE-LEW-12296-1] N80-19425
Characterization of tungsten dispenser cathodes using ISS and SIMS
[AD-A077592] N80-19428
Dual beam dual mode TWT
[AD-A077576] N80-19433
TREES (MATHEMATICS)
Linear time calculations of geometric properties using quadtrees
[AD-A078087] N80-19897
TREES (PLANTS)
Remote sensing applications to resource problems in South Dakota — Chamberlain, Rapid City, Watertown; Spink County; Lake Herman and Six-Mile Creek Watersheds; and Missouri River waterfowl
[E80-10086] N80-19593
TRIAXIAL STRESSES
Indirect deformation (strain) measurements and calibrations in Sandia triaxial apparatus for rock testing to 250 C
[SAND-79-0114] N80-19696
TRIBOLOGY
Comparison of the tribological properties at 25 C of seven different polyimide films bonded to 301 stainless steel
[NASA-TM-81413] N80-19283
TROPICAL METEOROLOGY
Tropical cyclone origin, movement, and intensity characteristics based on data compositing techniques
[AD-A079624] N80-19739
TROPICAL REGIONS
Equatorial Pacific Ocean variability: Seasonal and El Nino times scales
[AD-A077691] N80-19724
Certain questions of the acclimatization of construction workers to the conditions of a subtropical climate
[NASA-TM-75728] N80-19787
TROPICAL STORMS
Tropical cyclone origin, movement, and intensity characteristics based on data compositing techniques
[AD-A079624] N80-19739
TROPOSPHERE
Tropospheric refractive studies for SPADATS radar sites
[AD-A077024] N80-19338
Hybrid ray-mode formulation of tropospheric propagation N80-19382
TROPOSPHERIC SCATTERING
Tropospheric effects on HF Propagation N80-19380
TUNDRA
LANDSAT digital analysis of the initial recovery of the Kokolik River tundra fire area, Alaska
[E80-10080] N80-19588
Research on dynamics of tundra ecosystems and their potential response to energy resource development
[DOE/SF-61525-1] N80-19642
TUNGSTEN
Characterization of tungsten dispenser cathodes using ISS and SIMS
[AD-A077592] N80-19428
TURBINE BLADES
Structural analysis of hollow blades: Torsional stress analysis of hollow fan blades for aircraft jet engines
[NASA-TM-75718] N80-19111
Novel ceramic turbine rotor concepts
[AD-A078669] N80-19118
Investigation of fan blades shroud mechanical damping
[AD-A078439] N80-19120
Rejuvenation of turbine blade material by thermal treatment — of the heat resistant alloy blade material
[AD-A077527] N80-19121
TURBINE ENGINES
Advanced infrared signature prediction program. Spectral calculation of radiation from a turbine propulsion system as intercepted by an observer (SCORPION). Volume 3: Analysis
[AD-A078436] N80-19124
TURBOCOMPRESSORS
Basic studies of rotating stall in axial flow compressors
[AD-A077690] N80-19115
Aerodynamic and acoustic investigations of axial flow fan and compressor blade rows, including three-dimensional effects
[AD-A077712] N80-19116
TURBOFAN AIRCRAFT
A mission training simulator for the Nimrod MR MK 2 and some aspects of the derivation and verification of its system models N80-19626
TURBOFAN ENGINES
Novel ceramic turbine rotor concepts
[AD-A078669] N80-19118
TURBOJET ENGINES
Contribution of photoelastic analysis to the study of turbo-engine components
[BR71985] N80-19112
Evaluation of fuel character effects on J79 engine combustion system
[AD-A078440] N80-19119
TURBULENCE METERS
Development of a laser-Doppler velocimeter for use in the aquatic environment N80-19479
TURBULENT BOUNDARY LAYER
A theoretical analysis of simulated transonic boundary layers in cryogenic-nitrogen wind tunnels
[NASA-TP-1631] N80-19131
Turbulent boundary-layer analysis and experimental investigation of erosive burning problem of composite solid propellants
[AD-A077351] N80-19289
Recent improvements to the spinning body version of the EDDYBL computer program
[NASA-CR-152347] N80-19448
Influence of roughness and blowing on compressible turbulent boundary layer flow — skin friction drag
[AD-A077642] N80-19461
TURBULENT DIFFUSION
An analysis of turbulent diffusion flame in axisymmetric jet
[NASA-CR-162884] N80-19449
TURBULENT FLOW
Turbulence, combustion, pollutant, and stability characterization of a premixed, step combustor
[NASA-CR-3230] N80-19108
Evaluation of a locally homogeneous flow model of spray combustion
[NASA-CR-3202] N80-19293
Memory effects in turbulence
[NASA-TM-75516] N80-19451
TURBULENT MIXING
Mixing and gasification of coal in entraining flow systems
[FE-2666-T1] N80-19303
TURNING FLIGHT
Minimum time turns with thrust reversal — using control theory
[AD-A079851] N80-19078
TWISTING
Theory of twisted nonuniformly heated bars
[NASA-TM-75758] N80-19585
TWO DIMENSIONAL FLOW
Two dimensional convective flamespreading in packed beds of granular propellant — using digital simulation
[AD-A075325] N80-19285
TWO PHASE FLOW
Evaluation of a locally homogeneous flow model of spray combustion
[NASA-CR-3202] N80-19293

U

UH-1 HELICOPTER
Navigation systems for approach and landing of VTOL aircraft
[NASA-CR-152335] N80-19055
Preliminary Airworthiness Evaluation UH-1H helicopter equipped with Multiple Target Electronic Warfare System (MULTEWS)
[AD-A078476] N80-19067
The fabrication and testing of prototype UH-1 aircraft windshields manufactured with a sheet interlayer
[AD-A077711] N80-19080
ULCERS
Effect of habituation on the susceptibility of the rat to restraint ulcers
[NASA-TM-76072] N80-19748
ULTRAHIGH FREQUENCIES
A high resolution soil moisture radiometer N80-19181
Scintillation of UHF Satcom signals, ocurrence at Guam from mid-March 1978 - June 1979
[AD-A078267] N80-19328
Asymptotic high frequency techniques for UHF and above antennas — for ships
[AD-A077651] N80-19330
VHF/UHF path-loss calculations using terrain profiles deduced from a digital topographic data base N80-19366
An experimental investigation of multi-path scattering at L-band N80-19370
Experimental results on the free propagation of UHF waves in tunnels N80-19409
S-BAND MIC TRAPATT amplifier
[BLL-RTS-11884] N80-19430
ULTRAHIGH VACUUM
Sealing techniques for ultra-high vacuum systems — soldering techniques for metal to metal bonding and metal to nonmetal bonding
[BLL-RTS-11858] N80-19312
ULTRASONICS
Ultrasonic Doppler directional blood flow velocity meter
[RAE-LIB-TRANS-1918] N80-19780
UNDERCARRIAGES
Undercarriage drag prediction methods
[ESDU-79015] N80-19026
UNDERGROUND STORAGE
Nuclear waste management technology development activities
[LA-7921-PR] N80-19937
UNDERGROUND STRUCTURES
Low-cost bus-tunnels to the central business district
[UMTA-CA-06-0116-79-1] N80-19990
UNDERWATER ACOUSTICS
Contributions to signal processing for the hallo program
[AD-A078217] N80-19326
UNDERWATER COMMUNICATION
Strategic blue-green optical communications program plan. Investment strategy toward an optical solution for satellite-to-submarine information transfer
[AD-A078345] N80-19344
UNDERWATER STRUCTURES
Dynamic structural model of a submerged ring
[AD-A078157] N80-19588
UNITED STATES OF AMERICA
Non-point source - stream nutrient level relationships: A nationwide study. Supplement 1: Nutrient map reliability
[PB80-112891] N80-19679
UNIVERSITIES
A multidisciplinary approach to remote sensing education N80-20007
Remote sensing research activities related to academic institutions N80-20008
Opportunities and problems in introducing or expanding the teaching of remote sensing in universities N80-20011
UNIVERSITY PROGRAM
NASA programs in technology transfer and their relation to remote sensing education N80-20009
UNMANNED SPACECRAFT
Proceedings of the Association for Unmanned Vehicle Systems AUVS '79: 6th Annual Convention
[AD-A077877] N80-20018

UNSTEADY FLOW
Outline of research on oscillating boundary layers
[NASA-TM-75806] N80-19453
UPPER ATMOSPHERE
Nitric oxide ion and uranium oxide ion studies
[AD-A077870] N80-19688
The 19702A GSRS, missile number 310, round number B-33, 27 August 1979
[AD-A079990] N80-19726
The 19702A GSRS, Missile Number BR-3, Round Number B-35, 31 August 1979
[AD-A079991] N80-19727
The 19702A GSRS, missile numbers 308, 309, round numbers B-31, B-32, 18 August 1979
[AD-A079992] N80-19728
The 19306B GSRS, Missile Numbers 1043, 1045, Round Numbers V-64, V-65, 17 August 1979
[AD-A079993] N80-19729
The 19070ZA GSRS, Missile Number 004, Round Number B-30, 17 August 1979
[AD-A079999] N80-19730
The 19702D GSRS, Missile Number 023, Round Number B-38, 8 September 1979
[AD-A080000] N80-19731
The 12821A Lance, Missile Number 4819, Round Number 325 NCL, 13 August 1979
[AD-A079995] N80-19732
The 19702A GSRS, missile number 311, round number B-39, 10 September 1979: Meteorological Data Report
[AD-A080001] N80-19733
The 19304D GSRS, missile number 1063, round number V-67, 29 August 1979: Meteorological Data Report
[AD-A080062] N80-19734
URANIUM
Video processing of remote sensor data applied to uranium exploration in Wyoming
[GJBX-171(79)] N80-19603
URANIUM FLUORIDES
Argon/UF6 plasma experiments: UF6 regeneration and product analysis
[NASA-CR-3259] N80-19935
URANIUM OXIDES
Nitric oxide ion and uranium oxide ion studies
[AD-A077870] N80-19688
URBAN TRANSPORTATION
Low-cost bus-tunnels to the central business district
[UMTA-CA-06-0116-79-1] N80-19990
URETHANES
The fabrication and testing of prototype UH-1 aircraft windshields manufactured with a sheet interlayer
[AD-A077711] N80-19080
USER MANUALS (COMPUTER PROGRAMS)
Fourier Transform Infrared Spectroscopy (FTIS). Volume 2: User's manual
[AD-A079997] N80-19228

V

V/STOL AIRCRAFT
Proceedings of a Workshop on V/STOL Aircraft Aerodynamics, volume 2 — conferences
[AD-A078909] N80-19042
Proceedings of a Workshop on V/STOL Aircraft Aerodynamics, volume 1
[AD-A079115] N80-19074
Avionics logistics support including V/STOL, LAMPS, and instrument repair
[AD-A077460] N80-19087
Preliminary study of VTO thrust requirements for a V/STOL aircraft with lift plus lift/cruise propulsion
[NASA-TM-81429] N80-19110
Microsprocessor control of low speed V/STOL flight
[AD-A077661] N80-19129
Predicting field of view requirements for VSTOL aircraft approach and landing N80-19847
VACUUM SYSTEMS
Sealing techniques for ultra-high vacuum systems — soldering techniques for metal to metal bonding and metal to nonmetal bonding
[BLL-RTS-11856] N80-19312
VALLEYS
Multisensor analysis of hydrologic features in the Wind River Range, Wyoming with emphasis on the SEASAT SAR
[E80-10083] N80-19591
VANADIUM
The effect of nickel and nitrogen on void formation in vanadium N80-19232
VAPOR PHASES
VPE growth of (Al, Ga)As
[AD-A078254] N80-19967
VAPORIZING
Evaluation of classical vaporization and ionization interferences in a miniature ICP
[AD-A077886] N80-19225
VARIABLE CYCLE ENGINES
Variable cycle engine multivariable control synthesis: Control structure definition
[AD-A078670] N80-19117
VEGETATION
Biological and geophysical factors of electromagnetic wave propagation and their use in digital data banks N80-19363
VEGETATION GROWTH
Quantitative estimation of plant characteristics using spectral measurement: A survey of the literature
[E80-10078] N80-19587
LANDSAT digital analysis of the initial recovery of the Kokolik River tundra fire area, Alaska
[E80-10080] N80-19588
A critical comparison of remote sensing and other methods for nondestructive estimation of standing crop biomass
[E80-10082] N80-19590
VELOCITY MEASUREMENT
Low velocity performance of a high speed vane anemometer
[AD-A077457] N80-19475
VELOCITY MODULATION
Coupled cavity traveling wave tube with velocity tapering
[NASA-CASE-LEW-12296-1] N80-19425
VERBAL COMMUNICATION
Structures in aeronautical phraseology: From English to Spanish N80-19978
VERTICAL DISTRIBUTION
Methods of determining ionospheric structure from oblique sounding data N80-19384
VERTICAL TAKEOFF
Preliminary study of VTO thrust requirements for a V/STOL aircraft with lift plus lift/cruise propulsion
[NASA-TM-81429] N80-19110
VERTICAL TAKEOFF AIRCRAFT
Navigation systems for approach and landing of VTOL aircraft
[NASA-CR-152335] N80-19055
Development of VTOL flying qualities criteria for low speed and hover
[AD-A079911] N80-19085
Vorticity associated with multiple jets in a crossflow — vertical takeoff aircraft
[NASA-CR-162855] N80-19454
VERY HIGH FREQUENCIES
VHF/UHF path-loss calculations using terrain profiles deduced from a digital topographic data base N80-19366
VERY HIGH FREQUENCY RADIO EQUIPMENT
Adjacent-signal characteristics and co-channel interference of a land mobile lincompex system in the VHF band
[BLL-RTS-11914] N80-19318
VESTIBULAR TESTS
Effect of sodium bicarbonate on reactivity and trophics of vestibular analyzer N80-19769
VIBRATION DAMPING
Investigation of fan blades shroud mechanical damping
[AD-A078439] N80-19120
Viscoelastic polymer for printed-circuit-board vibration damping
[AD-A077803] N80-19275
Damping Effects in Aerospace Structures
[AGARD-CP-277] N80-19572
Mathematical formulation of damping for structural response analysis N80-19573
Prediction of the structural damping of a vibrating stiffened plate N80-19574
Numerical modelling of structures to account for internal damping N80-19575
Some recent measurements of structural dynamic damping in aircraft structures N80-19578
Effect of structural damping on the dynamic response of spacecraft N80-19577
Spacecraft damping considerations in structural design N80-19578
Vibration damping on San Marco satellites; results and comments N80-19579
Damping problems in acoustic fatigue N80-19580
Dynamic damping investigations on composites N80-19581
Viscoelastic damping in USAF applications N80-19582
Report on the use of abatement techniques for problems related to vibrations and noise N80-19583
Damping effects in joints and experimental tests on riveted specimens N80-19584
VIBRATION ISOLATORS
Viscoelastic damping in USAF applications N80-19582
VIBRATION TESTS
Dynamic Environmental Qualification Techniques
[AGARD-R-682] N80-19080
Application of MIL-STD-810C dynamic requirements to USAF avionics procurements N80-19091
Civil aircraft equipment environment qualification techniques N80-19093
Damping Effects in Aerospace Structures
[AGARD-CP-277] N80-19572
VIDEO EQUIPMENT
Aviation training using video disk technology N80-19828
VIEW EFFECTS
Effect of field of view and monocular viewing on angular size judgements in an outdoor scene
[NASA-TM-81176] N80-19792
VISCOELASTIC DAMPING
Viscoelastic damping in USAF applications N80-19582
VISCOELASTICITY
Viscoelastic polymer for printed-circuit-board vibration damping
[AD-A077803] N80-19275
Numerical analysis of rafts on visco-elastic media using eigenvector expansions
[PB80-112907] N80-19570
Report on the use of abatement techniques for problems related to vibrations and noise N80-19583
VISCOSITY
Solutions to wave equations using an artificial viscosity method
[UCRL-TRANS-11482] N80-19909
VISCOUS FLOW
Viscous flow in the region of a rounded trailing edge
[AD-A078588] N80-19045
Numerical integration of compressible, viscous flow equations
[AD-A077558] N80-19457
Steady-wave analysis of the effect of porosity on viscous and inviscid detonations by use of a reactive-porous analog
[LA-7819] N80-19463
VISCOUS FLUIDS
Convective flows of viscous fluid in spherical layers. Certain astrophysical applications
[NASA-TM-75923] N80-19452
VISIBILITY
The visiceilometer: A portable cloud height and visibility indicator
[AD-A078332] N80-19713
Some models for visibility
[AD-A075490] N80-19950
VISUAL AIDS
The use of multimedia and programmed teaching machines for remote sensing education N80-20012
VISUAL FIELDS
Predicting field of view requirements for VSTOL aircraft approach and landing N80-19847
VISUAL PERCEPTION
Development of a visual inspection technique (optical assessment of aircraft transparencies)
[AD-A079369] N80-19086
Spatial filtering and mechanisms of perception
[AD-A077622] N80-19786
Effect of field of view and monocular viewing on angular size judgements in an outdoor scene
[NASA-TM-81176] N80-19792
Helicopter pilot detection of the two different camouflaged hawk batteries
[AD-A077954] N80-19803
Differential geometry, surface patches and convergence methods
[AD-A078061] N80-19927

VLASOV EQUATIONS
Nonlinear wave evolution in VLASOV plasma: A lie-transform analysis
[LBL-8185] N80-19962
VOID RATIO
The effect of nickel and nitrogen on void formation in vanadium N80-19232
VOLTAGE CONVERTERS (DC TO DC)
A new approach to the design of highly efficient regulated dc-to-dc converters
[AD-A078627] N80-19440
VOLTAGE REGULATORS
A new approach to the design of highly efficient regulated dc-to-dc converters
[AD-A078627] N80-19440
VORTICES
Rotary balance data for a typical single-engine general aviation design for an angle-of-attack range of 8 deg to 90 deg. 1: Low-wing model A — fluid flow and vortices data for general aviation aircraft to determine aerodynamic characteristics for various designs
[NASA-CR-3100] N80-19030
Memory effects in turbulence
[NASA-TM-75516] N80-19451
VORTICITY
Vorticity associated with multiple jets in a crossflow — vertical takeoff aircraft
[NASA-CR-162855] N80-19454
VULNERABILITY
Evaluation of equipment vulnerability and potential shock hazards — carbon fibers N80-19197
Risk assessment of carbon fiber composite in surface transportation N80-19205

W

WAFERS
Automated array assembly task in-depth study of silicon wafer surface texturizing
[NASA-CR-162883] N80-19618
Slicing of silicon into sheet material. Silicon sheet growth development for the large area silicon sheet task of the low cost solar array project
[NASA-CR-162626] N80-19623
WAKES
Memory effects in turbulence
[NASA-TM-75516] N80-19451
WALL FLOW
Analytic and numerical investigation of the convergence for the adaptive-wall concept
[AD-A078203] N80-19134
WALL PRESSURE
Wall pressure fluctuations during transition on a flat plate
[AD-A075379] N80-19035
WAR GAMES
Simulation within military defence systems for training and evaluation N80-19819
Air-to-air engagement simulation N80-19834
WASTE DISPOSAL
A comparison of the results of several heat transfer computer codes when applied to a hypothetical nuclear waste repository
[ORNL/TM-7112] N80-19464
Use of remote sensing for land use policy formulation — Kalamazoo, Lake, Mecosta, Newaygo, Oscsola, and Wexford counties, Michigan
[E80-10085] N80-19582
Remote sensing applications to resource problems in South Dakota — Chamberlain, Rapid City; Watertown; Spink County; Lake Herman and Six-Mile Creek Watersheds; and Missouri River waterfowl
[E80-10086] N80-19593
Stress analysis of high-level waste canisters: Methods, applications, and design data
[PNL-3036] N80-19939
WASTE ENERGY UTILIZATION
Waste heat recovery unit design for gas turbine propulsion systems
[AD-A078154] N80-19503
WASTE TREATMENT
Nuclear waste management technology development activities
[LA-7921-PR] N80-19937
Evaluation of operation and maintenance factors limiting biological wastewater treatment plant performance
[PB80-108947] N80-19993
WASTE WATER
Evaluation of operation and maintenance factors limiting biological wastewater treatment plant performance
[PB80-108947] N80-19993
WASTES
A biological waste water monitor study using differential laser light scattering from bacteria
[AD-A078527] N80-19985
WATER FLOW
Development of a laser-Doppler velocimeter for use in the aquatic environment N80-19479
WATER HEATING
Solar energy system performance evaluation: Seasonal report for SEMCO, Lowshetchee, Florida
[NASA-CR-161379] N80-19827
Solar energy system performance evaluation: A seasonal report for SEMCO, Macon, Georgia
[NASA-CR-161380] N80-19829
Installation guidelines for solar heating system, single-family residence at New Castle, Pennsylvania
[NASA-CR-161355] N80-19830
WATER QUALITY
Water quality monitor — spacecraft potable water
[NASA-CR-160412] N80-19983
WATER RESOURCES
Regional systems development for geothermal energy resources. Pacific region: California and Hawaii. Task 3: Water resources evaluation — for generation of electric power
[DOE/ET-28432-3/1] N80-19606
Regional systems development for geothermal energy resources. Pacific region: (California and Hawaii). Task 3: Water resources evaluation, appendices — for generation of electric power
[DOE/ET-28432-3/2] N80-19607
WATER TEMPERATURE
Sea surface temperature of the coastal zones of France. Heat Capacity Mapping Mission (HCMM)
[E80-10057] N80-19585
SMMR simulator radiative transfer calibration model. 1: Derivation
[E80-10081] N80-19589
Coastal water temperature in the southeastern portion of Brazil utilizing oceanographic data and NOAA sensor data, volume 2
[INPE-1569-RPE/070-VOL-2] N80-19745
WATER TREATMENT
Prototype overland flow test data: June 1977 - May 1978
[AD-A078743] N80-19597
WATER VAPOR
Atmospheric water vapor absorption at 12 CO2 laser frequencies
[NASA-CR-162950] N80-19683
WATER WAVES
Transverse oscillations of smooth and rough cylinders in harmonic flow
[AD-A078271] N80-19034
A system for using radar to record wave direction
[AD-A078307] N80-19342
HF skywave radar estimates of the track, surface wind and waves of hurricane Anita N80-19403
Delta7: A computer model of Delta growth
[AD-A077053] N80-19692
WATERFOWL
Remote sensing applications to resource problems in South Dakota — Chamberlain, Rapid City; Watertown; Spink County; Lake Herman and Six-Mile Creek Watersheds; and Missouri River waterfowl
[E80-10086] N80-19593
WATERSHEDS
Remote sensing applications to resource problems in South Dakota — Chamberlain, Rapid City; Watertown; Spink County; Lake Herman and Six-Mile Creek Watersheds; and Missouri River waterfowl
[E80-10086] N80-19593
WATERWAVE ENERGY CONVERSION
Wave power extraction by floating bodies
[AD-A078058] N80-19637
WAVE DISPERSION
An improved dispersion system for simultaneous multielement analysis by flame spectroscopy N80-19215
WAVE EQUATIONS
Solutions to wave equations using an artificial viscosity method
[UCRL-TRANS-11492] N80-19909
WAVE FRONT DEFORMATION
HF wavefront irregularities observed on a large aperture receiving array N80-19396
WAVE PROPAGATION
Electromagnetic transmission through a filled slit of arbitrary cross section in a conducting plane of finite thickness
[AD-A078477] N80-19340
Ray optical description of waves guided by integrated dielectric cylinder-cone structures
[AD-A078344] N80-19343
Scattered radiation fields from rough surfaces full wave solutions N80-19356
Diffraction phenomena during multipath fading N80-19371
Experimental results on the free propagation of UHF waves in tunnels N80-19409
Effective use of natural modes in VHF and UHF tunnel propagation N80-19411
Body and surface wave modeling of observed seismic events
[AD-A078056] N80-19694
Nonlinear wave evolution in VLASOV plasma: A lie-transform analysis
[LBL-8185] N80-19962
WAVE REFLECTION
Airborne measurements of electromagnetic wave reflections from land and sea water N80-19355
WAVEFORMS
Field resonance propulsion concept
[NASA-TM-80961] N80-19184
WAVEGUIDE WINDOWS
Electromagnetic transmission through a filled slit of arbitrary cross section in a conducting plane of finite thickness
[AD-A078477] N80-19340
WAVEGUIDES
Modes of dielectric waveguides of arbitrary cross-sectional shape
[AD-A077032] N80-19337
A computer program for ELF/VLF pulse propagation in a laterally homogeneous Earth-ionosphere waveguide
[AD-A078306] N80-19341
Ray optical description of waves guided by integrated dielectric cylinder-cone structures
[AD-A078344] N80-19343
High-frequency signal propagation and scattering in guiding channels N80-19351
Principles of HF communication in tunnels using open transmission lines and leaky cables N80-19405
Dual beam dual mode TWT
[AD-A077576] N80-19433
WAVELENGTHS
Synthetic aperture imaging techniques at short wavelengths
[AD-A078720] N80-19336
WEAPON SYSTEMS
MEK: A new procedure for development of maintenances policies — in logistics management and cost estimates for weapon systems N80-19556
Remarks on simulation. Objectives/areas of use/possibilities/limitations: An overview N80-19812
Use of simulation in the evaluation of the IFFN process N80-19833
Competition in the acquistion of major weapons systems
[AD-A078268] N80-19981
WEAPONS DEVELOPMENT
I/J band low-cost crossed-field amplifier
[AD-A077322] N80-19436
WEAR
Proceedings of the National Symposium on Wear and Corrosion
[AD-A077406] N80-19253
WEATHER
Modeling the space conditioning energy demand of a community as a function of weather
[COO-1340-65] N80-19644
Methods for analysing the homogeneity of climatological series
[BLL-TRANS-1407-(9022.549)] N80-19701
WEATHER FORECASTING
Some additional models for rainfall
[AD-A077872] N80-19709
Initial studies in objective forecasting of mesoscale weather using interactive computer system
[AD-A077343] N80-19718

WEATHER MODIFICATION
Randomization tests in support of some statistical analyses of a weather modification experiment [AD-A076336] N80-19736
Federal weather modification efforts need congressional attention [PB80-108511] N80-19742
Weather modification effects and management. A bibliography with abstracts [PB80-802796] N80-19744

WEATHER STATIONS
Preliminary assessment of an automated system for detecting present weather [AD-A076031] N80-19706

WEIBULL DENSITY FUNCTIONS
Fast estimation of three parameters of Weibull law N80-19526
Some models for visibility [AD-A075490] N80-19950

WEIGHT REDUCTION
Lightweight pilot helmets: The issue of weight versus protection [AD-A076325] N80-19806

WEIGHTLESSNESS
External respiration and acid-base balance of human blood during long-term antiorthostatic hypokinesia and in the recovery period N80-19764
Blood circulation under conditions of weightlessness [NASA-TM-76036] N80-19766

WELD TESTS
Investigation of weld pool structure and property control in pulsed arc welding [AD-A078222] N80-19501

WELDED STRUCTURES
Investigation of weld pool structure and property control in pulsed arc welding [AD-A078222] N80-19501

WETLANDS
Use of remote sensing for land use policy formulation — Kalamazoo, Lake, Mecosta, Newaygo, Osceola, and Wexford counties, Michigan [E80-10085] N80-19592

WHEAT
Use of remote sensing for land use policy formulation — Kalamazoo, Lake, Mecosta, Newaygo, Osceola, and Wexford counties, Michigan [E80-10085] N80-19592

WHITE NOISE
Analysis of first and second order binary quantized digital phase-locked loops for ideal and white Gaussian noise inputs [NASA-CR-162654] N80-19056

WIND (METEOROLOGY)
HF skywave radar estimates of the track, surface wind and waves of hurricane Anita N80-19403
The NASA/MSFC global reference atmospheric model: MOD 3 (with spherical harmonic wind model) [NASA-CR-3256] N80-19704
Satellite training course notes. Part 4: Cloud patterns and the upper air wing field [AD-A077557] N80-19712
Winter shamal in the Persian Gulf [AD-A077727] N80-19720
Experimental pulsed laser remote crosswind measurement system. Feasibility study and design, part 5 [AD-A077631] N80-19721
Development of aerodynamic disturbance test procedures, volume 1: Executive summary [PB80-108145] N80-19991
An experimental study of highway aerodynamic interference [PB80-109986] N80-19992

WIND DIRECTION
Sea-state directional spectra observed by HF Doppler radar N80-19401

WIND PROFILES
Lidar measurement of boundary layer winds and convective structure [AD-A078590] N80-19719

WIND TUNNEL APPARATUS
Toward new transonic windtunnels [AGARD-AG-240] N80-19137
Development of the cryogenic tunnel concept and application to the US National Transonic Facility N80-19139

WIND TUNNEL DRIVES
An investigation of the quality of the flow generated by three types of wind tunnel (Ludwieg tube, Evans clean tunnel and injector driven tunnel) N80-19138

WIND TUNNEL MODELS
Application of the Estimation-Before-Modeling (EBM) system identification method to the high angle of attack/sideslip flight of the T-2C jet trainer aircraft. Volume 2: Simulation study using T-2C wind tunnel model data [AD-A079523] N80-19061
Developing, mechanizing and testing of a digital active flutter suppression system for a modified B-52 wind-tunnel model [NASA-CR-159155] N80-19566

WIND TUNNEL TESTS
Aeroacoustic wind-tunnel tests of a light twin-boom general-aviation airplane with free or shrouded-pusher propellers — in the Langley full-scale tunnel [NASA-TM-80203] N80-19023
Wind tunnel tests of a spinning 105 mm artillery shell model with canard control surfaces [AR-001-906] N80-19032
Experimental investigation of a circulation control aileron [AD-A078825] N80-19046
The cryogenic wind tunnel: another option for the European Transonic Facility N80-19140

WIND TUNNEL WALLS
Analytic and numerical investigation of the convergence for the adaptive-wall concept [AD-A078203] N80-19134

WIND TUNNELS
Laser-Raman flow-field diagnostics of two large hypersonic test facilities [AD-A078289] N80-19135

WIND VARIATIONS
Equatorial Pacific Ocean variability: Seasonal and El Nino times scales [AD-A077031] N80-19724

WIND VELOCITY
Solving the non-linear equations of deep convection [BLL-TRANS-1397-(9022.549)] N80-19680
Some models for windspeed [AD-A077048] N80-19722

WINDPOWER UTILIZATION
Teetered, tip-controlled rotor: Preliminary test results from Mod-0 100-kW experimental wind turbine [NASA-TM-81445] N80-19813
Installation and checkout of the DOE/NASA Mod-1 2000-kW wind turbine generator [NASA-TM-81444] N80-19814
General reliability and safety methodology and its application to wind energy conversion systems [SERI/TR-35-234] N80-19645

WINDPOWERED GENERATORS
Teetered, tip-controlled rotor: Preliminary test results from Mod-0 100-kW experimental wind turbine [NASA-TM-81445] N80-19813
Installation and checkout of the DOE/NASA Mod-1 2000-kW wind turbine generator [NASA-TM-81444] N80-19814

WINDSHIELDS
The fabrication and testing of prototype UH-1 aircraft windshields manufactured with a sheet interlayer [AD-A077711] N80-19080
Evaluation of aircraft windshield materials in a simulated supersonic flight environment [AD-A078673] N80-19082
Development of a visual inspection technique (optical assessment of aircraft transparencies) [AD-A079369] N80-19086

WING LOADING
Estimation of the endurance of civil aircraft wing structures — life estimate method for wing loading on general aviation aircraft [ESDU-79024] N80-19060

WINTER
NOAA satellite monitoring of snow cover in the Northern Hemisphere during the winter of 1977 N80-19584

WIRE
Figure-of-merit for bare and coated wires and flat ribbon jumpers [BDX-613-2304] N80-19445

WORK CAPACITY
Effects of unusual schedules of daily activity and sleep deprivation on man's functional state and work fitness N80-19758

WORK-REST CYCLE
Scheduling work and rest periods during long-term space flights N80-19758

WORKLOADS (PSYCHOPHYSIOLOGY)
NASA TLA workload analysis support. Volume 1: Detailed task scenarios for general aviation and metering and spacing studies [NASA-CR-3199] N80-19791
Human work measurement. A bibliography with abstracts [PB80-803186] N80-19807

WYOMING
Multisensor analysis of hydrologic features in the Wind River Range, Wyoming with emphasis on the SEASAT SAR [E80-10083] N80-19591
Video processing of remote sensor data applied to uranium exploration in Wyoming [GJBX-171(79)] N80-19609

X

X RAY ABSORPTION
X-ray absorption studies of graphite intercalates and metal ammonia solutions [LBL-9840] N80-19212
Determination of morphology and electronic structure in solids with 20-1000 eV radiation — techniques of photon absorption and photoemission for spectroscopic analysis of materials [LBL-9482] N80-19971

X RAY ASTRONOMY
X-ray optical properties of a Wolter telescope [NASA-TM-75811] N80-19994

X RAY IMAGERY
Coordinated field operation of balloon-borne auroral X-ray experiment from the ATS-F satellite conjugate region [AD-A078041] N80-19985

X RAY TELESCOPES
X-ray optical properties of a Wolter telescope [NASA-TM-75811] N80-19994
Analysis of NOAA-MSFC GOES X-ray telescope [NASA-CR-161397] N80-19995

Y

YIELD
Quantitative estimation of plant characteristics using spectral measurement: A survey of the literature [E80-10078] N80-19587
A critical comparison of remote sensing and other methods for nondestructive estimation of standing crop biomass [E80-10082] N80-19590

YIELD STRENGTH
Research on nondestructive testing [AD-A078483] N80-19517

YTTRIUM
The elastic and inelastic scattering of 0.8 GeV protons by Y-89 and Zr-90 N80-19934

Z

ZINC ALLOYS
The corrosion fatigue behavior of a high purity Al-Zn-Mg-Cu alloy [AD-A077481] N80-19247

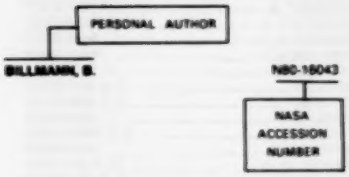
ZIRCONIUM
The elastic and inelastic scattering of 0.8 GeV protons by Y-89 and Zr-90 N80-19934

ZIRCONIUM OXIDES
Improved impact fracture resistance in oxidation-toughened Si3n4-20 vol% ZrO2 [AD-A078633] N80-19241

ZONE MELTING
Alloy development of oxide dispersion strengthened high volume gamma nickel-base superalloys made by mechanical alloying [AD-A077615] N80-19252

PERSONAL AUTHOR INDEX

Typical Personal Author Index Listing



Listings in this index are arranged alphabetically by personal author. The NASA accession number denotes the number by which the citation is identified.

A

ABARBANEL, H. N80-19740
ABDRAKHMANOV, V. R. N80-19764
ABELES, F. N80-19795
N80-19796
N80-19797
N80-19798
N80-19799
ABRAHAM, K. M. N80-19635
ADAMS, N. A. N80-19985
ADAMS, R. J. N80-19054
ADCOCK, J. B. N80-19131
AGAN, W. E. N80-19157
AGNENI, A. N80-19579
AGRAWAL, P. K. N80-19153
AGY, V. N80-19390
AHLERS, E. N80-19773
AHLERS, J. N80-19773
AHNER, D. J. N80-19646
AIKENS, D. A. N80-19218
AKIYAMA, S. N80-19318
ALDRED, A. T. N80-19973
ALEKSOFF, C. C. N80-19336
ALFVIN, P. W. N80-19867
ALLCOCK, H. R. N80-19192
ALLEN, B. N80-19248
ALLEN, J. L. N80-19110
ALMEIDA, F. X. N80-19978
ALMOG, R. N80-19545
ALMQUIST, K. N80-19838
ALPER, J. N80-19211
ALT, R. E. N80-19187
N80-19188
ALVAREZ, E. S. N80-19827
ALYAKRINSKIY, B. S. N80-19756
AMBROSE, J. R. N80-19243
ANASTASIA, L. J. N80-19305
ANDERSON, R. D. N80-19344
ANDERSON, R. H. N80-19148
ANDREWS, A. N80-19559
ANDREWS, D. M. N80-19875
ANTONELLI, R. C. N80-19674
ANTONEVICH, V. D. N80-19701
ANTONOPOULOS, A. A. N80-19868
APPEL-HANSEN, J. N80-19353
ARBUCKLE, A. L. N80-20000
ARCHER, J. S. N80-19147
ARDIS, M. A. N80-19850
ARDUINI, C. N80-19579
ARLASHCHENKO, N. I. N80-19769
ARMENTROUT, D. W. N80-19673
ARMISTEAD, M. F. N80-19132
ARTHUR, M. G. N80-19319
ARTLEY, J. A. N80-19587
ARZIN, M. N80-19245
ASHBAUGH, J. N80-19025
ASHKENAS, I. L. N80-19085
ASTLING, E. G. N80-19735
ATTULY, R. N80-19528
AUCKLAND, D. T. N80-19340
AUGL, J. M. N80-19282
AZIZ, A. K. N80-19911

B

BABAYEV, A. N80-19787
BADAWI, F. N80-19917
BAHAR, E. N80-19358
BAHN, D. W. N80-19119
BAIRD, G. T. N80-19636
BAKER, G. R. N80-19281
BALABAN, H. S. N80-19527
BALDACCI, R. F. N80-19575
BALES, S. L. N80-19723
BALLARD, S. C. N80-19655
BALSH, D. T. N80-19083
BALSTERHOLT, W. H. N80-19714
BANNISTER, J. D. N80-19837
BAR-NESS, Y. N80-19890
BARAKOS, P. A. N80-19898
BARKMAN, W. E. N80-19489
BARNA, G. J. N80-19626
BARNES, J. C. N80-19595
BARNUM, J. R. N80-19402
BARON, S. N80-19083
BARRETT, J. H. N80-19832
BARRETT, T. J. N80-19379
BARRICK, D. N80-19404
BATES, R. E. N80-19597
BAUMGARTNER, C. E. N80-19218
BAUMGARTNER, S. J. N80-19066
BAUN, W. L. N80-19238
N80-19240
N80-19244
N80-19428
N80-19968
BAVUSO, S. J. N80-19534
BAXTER, T. N80-19711
BAXTER, W. N80-19683
BEAL, J. C. N80-19407
BEAN, S. J. N80-19707
N80-19717
N80-19722
N80-19950
BEAN, S. P. N80-19037
BEAN, S., J. N80-19709
BECKWITH, A. R. N80-19443
BEGER, R. N80-19268
BELL, G. C. N80-19641
BELL, V. L. N80-19195
BELLO, M. N80-19902
BELROSE, J. S. N80-19347
N80-19417
BENAVIDES, A. N80-19441
BENN, R. C. N80-19252
BENNETT, G. T. N80-19121
BENNINGHOFF, H. N80-19233
BENSON, R. C. N80-19220
BERDAHL, M. N80-19149
BERGBREITER, D. E. N80-19270
BERNSTEIN, P. A. N80-19986
BERTIN, C. N80-19526
BERTIN, F. N80-19399
BEST, R. G. N80-19593
BIBL, K. N80-19416
BIEN, F. N80-19688
BIERMANN, E. E. N80-19190
BIGGS, A. W. N80-19345
BINGHAM, C. R. N80-19488
BIRK, J. N80-19808
BLACKERBY, W. T. N80-19081
BLACKMAN, E. S. N80-19710
BLALOCK, T. V. N80-19444
BLASCHE, P. R. N80-19056
BLATT, M. H. N80-19185
BLOOM, K. A. N80-19180
BOARDMAN, K. W. N80-19539
BODE, L. R. N80-19417
BODNAR, D. G. N80-19329
BODNER, S. R. N80-19250
BOGGS, B. C. N80-19138
BOGHANI, A. B. N80-19075
BOGOMOLOV, V. V. N80-19764
BONNER, R. S. N80-19713
BOO, J. N80-19307
BOOKER, J. R. N80-19570
BORRI, M. N80-19580
BOTTERI, B. P. N80-19047
BOUDREAU, R. N80-19874
BOUNDS, J. R. N80-19861
BOUQUET, F. L. N80-19833
BOUTHORS, E. N80-19842
BOWDEN, L. W. N80-20014
BOWLEY, C. J. N80-19595
BOWYER, J. M. N80-19834
BOYD, J. T. N80-19949
BOYLAN, M. N80-19592
BRADEN, S. N80-19454
BRADLEY, P. A. N80-19400
BRADLEY, R. A. N80-19736
BRADSHAW, R. D. N80-19185
BRAMLEY, E. N. N80-19400
BRANDKAMP, W. N80-19487
BRANDON, C. A. N80-19237
BRAUN, R. N80-19834
BREAKEY, K. M. N80-19049
BREEMAN, J. H. N80-19088
N80-19089
BREIEN, T. N80-19354
BRILEY, W. R. N80-19045
BRINCHMANSEN, P. N80-19879
BRISHIN, A. I. N80-19751
BRISTER, J. G. N80-19066
BROCHE, P. N80-19401
BRODRICK, J. R. N80-19492
BRODSKY, S. J. N80-19833
BRODY, H. D. N80-19246
N80-19501
BROOKMAN, B. J., JR. N80-19505
BROOKS, D. R. N80-19142
BROWN, H. A. N80-19706
BROWN, J. N80-19588
BROWN, K. A. N80-19558
BROWN, L. S. N80-19838
BROWN, P. T. N80-19570
N80-19571
BROWN, R. J. N80-19744
BROWN, R. M. N80-19471
BROWNELL, T. N80-19808
BROWNING, D. L. N80-19158
BRUN, J. N80-19543
BRUNE, J. F. N80-19375
BRUNO, A. N80-19795
N80-19796
N80-19797
N80-19798
N80-19799
BRUSS, A. R. N80-19948
BUCHANAN, P. N80-19307
BUCK, R. C. N80-19907
BUEHLER, M. F. N80-19983
BURSSON, D. N80-19836
BULDHAUPT, L. F. N80-19653
BUMGARNER, R. A. N80-19038
BURDSALL, E. A. N80-19113
BURGESS, B. N80-19373
BURNS, C. C. N80-19644

BURNS, R. K. N80-19626
BURNSIDE, W. D. N80-19330
BUSH, H. G. N80-19158
BUSH, P. V. N80-19671
BUSSEY, A. J. N80-19595
BUTLER, G. B. N80-19298
BUTTERFIELD, A. J. N80-19199
BYCHKOV, V. P. N80-19774

C

CAFFEY, T. W. H. N80-19695
CALHOON, C. D. N80-19580
CAMBANIS, S. N80-19800
CAMPBELL, C. L. N80-19654
CAMPBELL, T. G. N80-19150
N80-19170
CANAL, E., JR. N80-19113
CARLE, W. E. N80-19737
CARLSON, C. T. N80-19403
CARLSON, G. E. N80-19362
CARRIGAN, B. N80-19490
N80-19491
N80-19656
N80-19658
N80-19659
N80-19660
N80-19683
N80-19684
N80-19685
N80-19812
CARROLL, J. J. N80-19243
CARROLL, R. J. N80-19920
N80-19921
N80-19922
CARRUTHERS, P. N80-19740
CARTER, H. K. N80-19488
CARTER, J., JR. N80-19612
CARY, J. R. N80-19662
CASKEY, G. R. N80-19255
CASSANET, G. N80-19585
CASSEL, L. A. N80-19044
CASSENTI, B. N. N80-19502
CASTANION, D. A. N80-19802
CASTELLANI, A. N80-19594
CATANI, G. N80-19629
CATE, R. B. N80-19587
CAVALLINI, G. N80-19580
CAVENY, L. H. N80-19301
CEBECI, T. N80-19458
CHABIN, J. C. N80-19529
CHACKO, C. C. N80-19981
CHAIKLIN, S. N80-19905
CHAIT, R. N80-19245
CHANDHOK, V. K. N80-19239
CHANDRASEKARAN, B. N80-19676
CHANG, A. T. C. N80-19360
CHAO, K. S. N80-20019
CHAPMAN, J. W., JR. N80-19122
CHARLOT, J. C. N80-19532
CHARON, W. N80-19103
CHARTOCK, M. A. N80-19655
CHATTERJEE, R. N80-19294
CHEBOTAREV, N. D. N80-19763
CHEN, C. L. N80-19339
CHEN, J. C. N80-19283
CHEN, R. N80-19167
CHEN, S. T. C. N80-19432
CHEN, W. S. N80-19653
CHENG, N. M. N80-19737
CHENG, S. W. N80-19301
CHESTUKHIN, V. V. N80-19772
CHEVERTON, K. J. N80-19502
CHILDLAW, R. N80-19944
CHIMAPPI, U. N80-19845
CHIU, D. M. N80-19986
CHIMURA, L. N80-19808
CHO, S. H. N80-19982
CHOU, P. C. N80-19082
N80-19211
CHOU, S. C. N80-19500
CHOVIT, A. R. N80-19048
CHRISTENSEN, C. P. N80-19483
CHRISTENSEN, L. S. N80-19450
N80-19703
CHRISTOPHE, J. N80-19140
CHU, K. R. N80-19957
CHUKHNO, E. I. N80-19786
CHUNG, P. M. N80-19449
CILIONE, A. B. C. N80-19310
CIRES, A. N80-19132
CLABORNE, H. C. N80-19484
CLEMENT, W. F. N80-19847
CLEVERLY, D. N80-19947
CLOTE, P. G. N80-19883
COAST, J. O. N80-19080
COATES, A. B. N80-19190
COCKRELL, C. R. N80-19183
COCKS, F. H. N80-19852
COE, H. H. N80-19496
COENSGEN, F. H. N80-19859
COHEN, I. D. N80-19741
COHEN, I. K. N80-19027
COHEN, M. G. N80-19333
COLEMAN, A. R. N80-19848
COLEMAN, R. N80-19677
COLLINS, J. L. N80-19814
COLOMBANT, D. G. N80-19958
COLWELL, R. N. N80-20004
N80-20014
N80-20017
COMBS, R. M. N80-19503
COMFORT, R. H. N80-19684
COMPTON, R. T., JR. N80-19331
CONNOLLY, D. J. N80-19425
COOK, A. R. N80-19058
COOPER, D. W. N80-19674
CORNELL, M. E. N80-19200
CORSANEGO, A. N80-19575
COUSTEIX, J. N80-19453
COWETT, P. M., JR. N80-19440
COWPERTHWAITE, M. N80-19290
COX, F. W. N80-19296
COX, K. E. N80-19299
COY, J. J. N80-19496
COYNE, V. J. N80-19372
CRADDOCK, J. N. N80-19562
CRAWFORD, F. W. N80-19954
CREMA, L. B. N80-19584
CRISOS, J. N80-19683
CROCKETT, F. N80-19803
CROMAN, R. N80-19062
CURLING, S. F. N80-19743
CURRY, B. P. N80-19191
CUSTER, J. R. N80-19479

D

DADSON, C. E. N80-19365
DALSTED, K. J. N80-19593
DAMBOLDT, T. N80-19378
DANESI, A. N80-19845
DANIELSON, R. L. N80-20013
DAO, K. C. N80-19241
DAVIS, P. W. N80-19507
DAVIS, Q. V. N80-19418
DAVY, B. N80-19822
DAY, D. R. N80-19279
DAYMAN, B. J. N80-19990
DAYMAN, B., JR. N80-19989
DEFRANCES, A. J. N80-19086
DEGAUQUE, P. N80-19409
DEGENER, M. N80-19577
DEHOFF, R. L. N80-19117
DELAGRANGE, A. D. N80-19439
DELANEY, J. R. N80-19364
DELGROSSO, A. N80-19575
DELOGNE, P. N80-19408
DELVECCHIO, R. N80-19795
N80-19796
N80-19797
N80-19798
N80-19799
DEMCHENKO, Y. A. N80-19786
DEMOULIN, B. N80-19409
DEMPSEY, B. J. N80-19314
DENLEY, D. R. N80-19071
DENZ, E. A. N80-19792
DERBIDGE, T. C. N80-19825
DERMENDZHIYEV, Y. N80-19767
DERYCK, L. N80-19411
DESCHAMPS, P. Y. N80-19585
DESFORGES, D. T. N80-19578
DESILETS, B. H. N80-19937
DESILVA, A. N80-19960
DEVANE, J. F. N80-19689
DEVANEY, A. N80-19944
DEVINE, W. D., JR. N80-19647
DEYST, J. J. N80-19539
DIEKMANN, V. L. N80-19067
DIGIACOMO, N. J. N80-19934
DILLON, H. K. N80-19672
DILLON, S. C. N80-19143
DIMMEY, L. J. N80-19652
DIMONT, S. N80-19550
DIONNE, G. F. N80-19970
DIRMUKES, E. B. N80-19672
DIXON, H. H. N80-19535
DMITRIYEV, B. S. N80-19751
DOD, L. R. N80-19181
DOEBRICH, M. N80-19357
DOHERTY, R. H. N80-19058
DOLLWET, H. H. N80-19274
DONOVAN, J. F. N80-19683
DOWNS, R. L. N80-19141
DOYLE, J. N80-19891
DOYLE, M. N80-19589
DRAKE, R. L. N80-19657
DRAKE, R. M. N80-19555
DREWES, D. R. N80-19657
DREYFUS, M. G. N80-19831
DREYFUSS, P. N80-19274
DRUMMOND, J. L. N80-19231
DUBITZKI, T. N80-19886
DUBROFF, R. E. N80-19384
DUKES, H. L. N80-19805
DULEBA, G. S. N80-19076
DUNBAR, W. G. N80-19188
DUNCAN, T. C. N80-19044
DUNLAP, B. D. N80-19873
DUNN, J. G. N80-19347
DUPERRAY, B. N80-19583
DUQUETTE, D. J. N80-19247
DURITZKI, T. N80-19877
DYER, F. N80-19444

E

EBERHARDT, L. E. N80-19668
EBNER, M. A. N80-19141
ECER, G. M. N80-19501
ECKSTEIN, Y. N80-19274
EDEN, J. G. N80-19480
EDESESS, M. N80-19645
EGGLESTON, R. G. N80-19086
EHRENBERGER, W. N80-19552
EICHLER, C. N80-19203
EIDENSHINK, J. E. N80-19593
EIDINOFF, H. N80-19504
EISEN, F. H. N80-19438
EISENTHAL, K. B. N80-19219
ELBER, W. N80-19196
ELKINS, T. J. N80-19392
ELLIOTT, R. A. N80-19721
ELLIS, S. R. N80-19792
ELORANTA, E. W. N80-19719
ENGLE, R. M., JR. N80-19065
ENTSHEVA, M. N80-19261
ERKELENS, L. J. J. N80-19844
ERSKINE, D. N80-19825
ESTES, J. E. N80-20006
N80-20014
EUBANK, R. L. N80-19915
EVANS, T. L. N80-19192
EVERETTE, J. N80-19586
EYGES, L. N80-19337

F

FABEROVA, A. N80-19754
FAETH, G. M. N80-19283
FAHRINER, C. J. N80-19992
FALLS, S. N80-19950
FAVORSKII, A. P. N80-19909
FEDER, E. I. N80-19540
FEDEROV, I. V. N80-19785
FEINSTEIN, J. N80-19690
FELDMAN, N. E. N80-19715
FELSEN, L. B. N80-19351
N80-19382
FENWICK, R. B. N80-19376
FIELDS, C. N80-19828
FIKSEL, J. N80-19201
FILLERS, R. W. N80-19189
FINLEY, L. A. N80-19321
FISCHBACH, U. N80-19702

FISH, R. B. N80-19075
FITZGERALD, A. L. N80-19132
FITZMAURICE, M. W. N80-19369
FLEISCHER, D. N80-19431
FLEMING, D. P. N80-19495
FLEMING, J. R. N80-19623
FLETCHER, G. R. N80-19704
FLEURY, R. N80-19393
FOLEY, E. W. N80-19723
FOSSEY, M. E. N80-19721
FOSTER, J. L. N80-19591
FOWLER, M. G. N80-19710
FOWLER, R. N80-19583
FRANK, L. H. N80-19106
FRANKE, H. M. N80-19812
FRANKLIN, J. A. N80-19127
FRANZINE, D. F. N80-19188
FRASER, D. C. N80-19533
FREEDMAN, J. E. N80-19833
FREEDY, A. N80-19051
FREIMAN, S. W. N80-19267
FRENCHU, W. R. N80-19670
N80-19670
FRENZEN, P. N80-19697
FRIEDT, J. M. N80-19973
FRISCH, H. P. N80-19188
FRITZ, G. N80-19265
FROST, W. N80-19703
FROUIN, R. N80-19585
FRYE, H. M. N80-19120
FUJITA, T. N80-19634
FULLER, T. J. N80-19182
FUSARO, R. L. N80-19263

G

GABILLARD, B. N80-19409
GADDIS, J. L. N80-19237
GADGEEL, V. L. N80-19236
GAERTNER, K. P. N80-19133
GAERTNER, W. W. N80-19965
GAGLIARDI, R. M. N80-19323
GAGNE, R. A. N80-19245
GALASCO, R. T. N80-19608
GALE, D. J. N80-19407
GALLAGHER, J. J. N80-19222
GALLAGHER, S. P. N80-19646
GALVES, J. P. N80-19543
GANDOLFO, D. A. N80-19437
GANGWAL, S. K. N80-19309
GANJI, A. T. N80-19108
GARASIMENKO, V. N. N80-19757
GARDNER, R. L. N80-19979
GARRETT, H. B. N80-19174
GARRITY, T. N80-19203
GASS, K. N80-19683
GATES, B. C. N80-19292
GAUDRIOT, L. N80-19583
GAUNTNER, J. W. N80-19863
GAZENKO, O. G. N80-19755
GEDDES, N. D. N80-19128
GEDNEY, C. J. N80-19035
GEHRING, G. A., JR. N80-19251
GEORGI, H. N80-19581
GERBER, H. N80-19423
GERSTEIN, M. N80-19047
GIANNO, P. N80-19337
GIAVOTTO, V. N80-19580
GIBSON, R. E. N80-19571
GILCREASE, A. A. N80-19038
GILLILAND, M. W. N80-19655
GILOI, H. G. N80-19371
GINSBURG, A. P. N80-19788
GIRARD, J. M. N80-19536
GIRAUD, M. N80-19536
GLASGOW, J. C. N80-19613
GLAZKOVA, N. A. N80-19766
GLEASON, C. C. N80-19119
GLIATTI, E. L. N80-19600
GLOD, G. D. N80-19785
GOERSS, J. S. N80-19711
GOLDBERG, J. N80-19549
GOLIKOV, A. P. N80-19764
GOLOVAN, A. A. N80-19467
GOLOVIZNIN, V. M. N80-19909
GONCHARENKO, Y. D. N80-19777
GONSALVES, R. N80-19944
GONZALEZ, S. N80-19867
GOOD, J. N80-19588
GOOD, R. R. N80-19477
GOODMAN, J. M. N80-19385
GORDON, D. E. N80-19567
GORINA, M. S. N80-19780
GOSLEE, J. W. N80-19154
GOUGH, P. S. N80-19295
GOURVEZ, P. N80-19383
GRAMLING, F. E. N80-19704
GRANDT, A. F. N80-19569
GRANT, P. K. N80-19189
GRAUER-CARSTENSEN, H. N80-19138
GRAVES, R. A., JR. N80-19031
GRAY, A. C., JR. N80-19993
GRAY, C. E., JR. N80-19132
GRAY, W. M. N80-19739
GRAYBIEL, A. N80-19789
GREEN, J. E. N80-19521
GREENO, J. G. N80-19904
N80-19905
GREGORY, T. J. N80-19025
GRIFFIN, J. M. N80-19068
GRIFFITH, W. S. N80-19513
GRIMSON, W. E. L. N80-19927
GROHSE, P. M. N80-19309
GROM, A. N80-19754
GROSSBARD, N. J. N80-19874
GROSSIN, J. N80-19836
GROUND, J. R. N80-19037
GROVES, N. C. N80-19456
GUALTIERI, J. N80-19486
GUDERLEY, K. G. N80-19043
GUERRO-GUZMAN, V. M. N80-19913
GUILLO, J. L. N80-19112
GUSEV, Y. N. N80-19780
GUSEVA, Y. V. N80-19757
GUSTAFSON, D. E. N80-19710

H

HABERCOM, G. E., JR. N80-19089
N80-19511
N80-19512
HACKING, K. N80-19928
HAGEN, J. F. N80-19067
HAGG, E. L. N80-19391
HAHN, H. T. N80-19208
HAIDL, G. N80-19092
HAIKEN, R. A. N80-19849
HALES, J. M. N80-19667
HALL, D. K. N80-19588
N80-19591
HALL, D. L. N80-19280
HAMEL, P. G. N80-19095
HAMILTON, H. H., II N80-19031
HAMILTON, T. A. N80-19520
HAMLET, R. G. N80-19850
HANBABA, R. N80-19388
HANLIN, D. E. N80-19280
HANNAH, M. J. N80-19471
HANSEN, E. R. N80-19870
HANSER, F. A. N80-19472
HANSMANN, J. N80-19262
HANSON, W. C. N80-19666
HARBAGE, A. S., JR. N80-19508
HARE, H. E. N80-19587
HARKRIDER, D. G. N80-19684
HARLAN, W. N80-19789
HARNISCHMACHER, E. N80-19387
HARPER, J. P. N80-19668
HARRINGTON, R. F. N80-19340
HARRIS, D. J. N80-19554
HARRIS, D. L. N80-19342
HARRISON, E. A. N80-19181
N80-19182
N80-19790
N80-19794
HARRISON, G. N80-19561
HARTZUIKER, J. P. N80-19137
N80-19140
HATCHER, D. C. N80-19266
HATHAWAY, W. T. N80-19205
HAUSER, D. N80-19508
HAYES, M. D. N80-19508
HAYNES, C. J. P. N80-19560
HEALY, R. D. N80-19824
HEARD, W. L., JR. N80-19156
HEAVENS, S. N. N80-19029
HEDMAN, P. O. N80-19303
HEFFLEY, P. M. N80-19256
N80-19445
HEIDERSBACH, R. N80-19248
HEILMAN, J. L. N80-19593
HEINER, G. N80-19547
HEISLER, R. L. N80-19743
HELMBERGER, D. V. N80-19694
HENDERSON, C. N80-19042
N80-19074
HENDERSON, H. V. N80-19914
HENDERSON, J. P. N80-19582
HENSLEE, S. P. N80-19567
HEPPNER, D. B. N80-19600
HERGENROTHER, K. M. N80-19205
HERMAN, J. F. N80-19040
HERMAN, R. G. N80-19002
HERON, M. L. N80-19269
N80-19414
HERR, R. W. N80-19563
HERZMANN, F. N80-19821
HEUSER, M. N80-19707
HICKS, R. N80-19937
HICKS, R. E. N80-19180
HIEFTJE, G. M. N80-19225
N80-19955
HIGA, W. H. N80-19499
HIGGINS, M. W. N80-19041
HILBERG, R. H. N80-19982
HILDRETH, E. N80-19941
HILL, D. A. N80-19405
N80-19410
N80-19412
HILLIER, F. S. N80-19982
HILTON, A. R. N80-19948
HILTON, R. G. N80-19535
HIMEL, V. N80-19795
N80-19796
N80-19797
N80-19798
N80-19799
HIMMEL, R. W. N80-19806
HINZE, J. O. N80-19481
HIZAL, A. N80-19348
HO, Y. C. N80-19999
HODGE, D. C. N80-19805
HODGES, R. V. N80-19224
HOFFMAN, J. B. N80-19082
HOGGATT, J. T. N80-19206
HOGUE, J. R. N80-19991
HOH, C. M. N80-19489
HOH, R. H. N80-19085
HOLDEN, S. C. N80-19823
HOLLECK, G. L. N80-19935
HOLLINDE, I. N80-19815
HOLLOWAY, J. N80-19865
HOLMES, J. F. N80-19721
HOLMES, J. K. N80-19427
HOLMES, R. D. N80-19443
HOLT, A. C. N80-19184
HOMICZ, G. F. N80-19118
HOOS, I. R. N80-20005
HOOSON, R. E. N80-19504
HOPF-WEICHEL, R. N80-19051
HOPKIN, V. D. N80-19820
HOREFF, T. N80-19047
HORN, B. K. P. N80-19470
N80-19536
HORSTEN, J. J. N80-19099
HORTENBACH, K. J. N80-19369
HORTON, C. N80-19586
HORWITZ, J. L. N80-19684
HOSSAIN, S. M. N80-19310
HOUSE, G. N80-19515
HOUSNER, J. M. N80-19563
HOUTMAN, A. M. N80-19916
HU, C. S. N80-19272
HUANG, H. N80-19903
HUDSON, C. C. N80-19474
HUDSON, J. B. N80-19210
HUFF, S. L. N80-19071
HUGHES, E. J. N80-19268
HUI, S. N80-19857
HULTBERG, R. S. N80-19030
HUNDEMANN, A. S. N80-19857
N80-19858
N80-19859
N80-19860
N80-19861
N80-19862
HUNT, L. R. N80-20019
HURLOCK, S. N80-19485
HUSTON, R. J. N80-19194
N80-19202

HUSTON, R. L. N80-19488
HUTTER, R. N80-19816
HYDE, J. C. N80-19548

I

IEUCHI, K. N80-19470
ILIFF, K. W. N80-19100
IM, K. H. N80-19449
INGLIS, D. J. N80-19655
N80-19656
N80-19657
INNIS, R. C. N80-19127
IOSELIANI, K. K. N80-19770
IRVOAS, J. N80-19838
ISAACS, R. G. N80-19595
ISMAIL, M. N80-19825
ISOBE, T. N80-19111
IVANOV, L. A. N80-19783
IZZO, D. N80-19692

J

JACKSON, C. S. N80-19692
JACOBSON, M. C. N80-19518
N80-19519
JACOMIN, H. E. N80-19992
JAFFE, P. N80-19611
JAIN, A. K. N80-19873
JAIN, J. R. N80-19873
JARVIS, F. C. N80-19271
JELINSKI, Z. N80-19589
JENKINS, B. M. N80-19329
JENKINS, L. M. N80-19158
JENKINS, R. W. N80-19391
JENKINS, T. F. N80-19597
JENSEN, P. S. N80-19696
JERMEY, C. N80-19032
JOHLER, J. R. N80-19058
JOHNSON, A. L. N80-19355
JOHNSON, C. B. N80-19131
JOHNSON, D. L. N80-19236
JOHNSON, D. R. N80-19719
JOHNSON, E. A. N80-19699
JOHNSON, G. R. N80-19644
JOHNSON, L. N80-19589
JOHNSON, L. J. N80-19657
JOHNSON, T. L. N80-19679
JONARDI, R. J. N80-19306
JONES, D. I. G. N80-19582
JONES, G. K. N80-19198
JONES, G. S. N80-19992
JONES, G. T. N80-19619
JONES, J. N80-19248
JONES, R. R. N80-19803
JONES, P. L. N80-19652
JONES, T. B. N80-19396
JONES, W. R. N80-19175
JONES, W. R., JR. N80-19497
JONKERS, H. L. N80-19098
N80-19099
JONUSHONIS, T. N80-19509
JORDAN, L. B. N80-19068
JORGENSEN, C. C. N80-19803
JUST, R. A. N80-19484
JUSTUS, C. G. N80-19704

K

KADIN, A. M. N80-19442
KADOKAWA, Y. N80-19318
KAELBERER, R. N80-19441
KAINER, S. N80-19459
KALANDAROV, S. K. N80-19774
KALELKAR, A. N80-19201
KALETKA, J. N80-19101
KAMA, W. R. N80-19851
KAPELKO, V. I. N80-19789
KAPLAN, L. N80-19309
KAPLIN, V. I. N80-19313
KARASAWA, H. N80-19421
KARELINA, Z. M. N80-19761
KAROL, I. L. N80-19709
KARPOV, A. P. N80-19772
KARST, R. H. N80-19365
KASTYAN, I. I. N80-19786
KATLOV, V. Y. N80-19772
KATZER, J. R. N80-19292
KELLEY, K. J. N80-19344
KELLEY, R. N80-19809
KENNER, C. V. N80-19626
KENNEDY, E. J. N80-19444
KENNEY, J. E. N80-19332
KENNEY, M. E. N80-19273
KENTON, E. N80-19807
KERR, J. R. N80-19721
KEY, R. W. N80-19183
KIDDER, R. E. N80-19861
KIERSTEAD, H. N80-19873
KILGORE, R. A. N80-19139
KILLOUGH, J. M. N80-19270
KIM, J. C. N80-19435
KINDLE, J. C. N80-19724
KING, J. H. N80-19897
KING, L. D. N80-19054
KING, R. J. N80-19048
N80-19050
KINO, G. S. N80-19517
KIRICHEK, L. Y. N80-19771
KITCHENS, C. W., JR. N80-19455
KLEER, J. D. N80-19891
KLEIN, R. H. N80-19891
KLEIN, V. N80-19096
KLEINMAN, D. N80-19063
KLETTE, R. N80-19872
KLIER, K. N80-19302
KLINE, M. B. N80-19520
N80-19545
KNIGHT, K. N80-19737
KNIGHT, T. F., JR. N80-19485
KOBAYASHI, K. N80-19235
KOBYSHEVA, N. V. N80-19701
KOEHLER, R. N80-19104
KOGAN, B. I. N80-19750
KOHLER, J. P. N80-19779
KOHLMAIER, G. H. N80-19702
KOHLMANN, W. H. N80-19434
KOLBE, B. N80-19230
KOLKHORST, H. E. N80-19810
KOMBERG, B. V. N80-19998
KONG, J. A. N80-19360
KOPANEV, V. I. N80-19788
KORMAN, H. F. N80-19048
KORNREICH, P. G. N80-19947
KORTOVICH, C. S. N80-19249
KOUYOUMJIAN, R. G. N80-19330
KOWEL, S. T. N80-19847
KRATZ, G. N80-19702
KRAUSE, C. N80-19623
KRUGER, J. N80-19243
KRUPP, B. N80-19589
KUBINA, S. J. N80-19347
KUESTERS, E. R. N80-19363
KUNG, H. H. N80-19874
KUO, K. K. N80-19299
KUPERMAN, G. G. N80-19851
KUSHNER, H. J. N80-19903
KUTATELADZE, S. S. N80-19447
KUZNESOFF, P. M. N80-19273
KVETNYANSKI, R. N80-19759
KWART, H. N80-19292

L

LACARRUBBA, S. N80-19064
LAEGER, H. N80-19485
LAFROTH, R. E. N80-19077
LANTI, E. H. N80-19044
LAMBERT, R. N80-19748
LAMPE, F. W. N80-19229
LAMPE, M. N80-19459
N80-19636
LANDGREBE, A. J. N80-19059
LANDO, J. B. N80-19279
LANE, N. E. N80-19848
LANGE-HESSE, G. N80-19395
LANGENBERG, K. J. N80-19349
N80-19357
LARIONOV, N. P. N80-19783
LAROCCA, A. J. N80-19598
N80-19599
LATTA, A. F. N80-19634
LAUCHE, H. N80-19365
LAURENSOU, J. N80-19530
LAUTNER, D. E. N80-19125
LAVRENCH, W. N80-19347
LEBLANC, L. P. N80-19469
LEDESSMA, R. N80-19842
LEDSHAM, W. H. N80-19710
LEE, A. J. N80-19919
LEE, B. G. W. N80-19567
LEE, C. C. N80-19699
N80-19840
LEE, J. N80-19294
LEE, L. C. N80-19224
LEE, M. H. N80-19721
LEEDOM, D. K. N80-19813
LEFTHERIS, B. P. N80-19504
LEINTZ, W. J. N80-19713
LEONARD, R. L. N80-19855
LEONG, H. H. N80-19844
LESSMAN, G. G. N80-19501
LESTER, J. V. N80-19854
LETOUZEY, J. N80-19829
LEVIN, S. N80-19829
LEVINE, J. S. N80-19854
LEVINE, M. W. N80-19899
LEVINSON, R. A. N80-19803
LEVY, B. C. N80-19802
LEVY, E. K. N80-19293
LEVY, J. B. N80-19296
LEVY, R. N80-19045
LEVY, S. C. N80-19843
LEWANDOWSKI, K. N80-19698
LEWIS, J. W. L. N80-19191
LEWIS, P. N80-19370
LEYERLE, R. W. N80-19629
LEYLAND, W. N80-19846
LICCIARDELLO, D. C. N80-19686
LIEBERMAN, P. N80-19048
LIEN, O. S. N80-19274
LIENTZ, B. P. N80-19853
LIMBURNER, H. N80-19523
LINDER, C. O. N80-19429
N80-19435
LINDHOLM, F. A. N80-19839
LINDQUIST, A. N80-19917
LINK, S. N80-19589
LINTON, P. M. N80-19847
LIOU, K. N. N80-19735
LIPA, B. N80-19404
LIPPS, W. D. N80-19180
LIRKOV, A. N80-19261
LISMAN, P. N80-19343
LITSOV, A. N. N80-19758
LO, C. F. N80-19134
LOBACHIK, V. I. N80-19751
LODGE, C. N80-19082
LONG, E. R., JR. N80-19172
LONG, S. I. N80-19438
LOOMIS, H. W. N80-19671
LORDI, J. A. N80-19116
LORENZ-MEYER, W. N80-19140
LORENZ, R. W. N80-19358
LORRE, J. J. N80-19996
LOTT, R. G. N80-19232
LOVETT, C. D. N80-19204
LUCACCINI, L. N80-19051
LUCAS, J. W. N80-19632
LUCKE, J. B. N80-19823
LUDWIG, G. R. N80-19109
N80-19115
N80-19118
LUMB, D. R. N80-20018
LURMANN, F. N80-19675
LYNCH, U. H. D. N80-19817
LYONS, K. A. N80-19113
LYTLE, R. J. N80-19408

M

MACDONALD, G. N80-19740
MACH, K. D. N80-19088
MACHA, M. N80-19620
MACINTYRE, H. R. N80-19789
MACKAY, R. A. M. N80-19407
MACKIE, L. N80-19548
MADDALON, D. V. N80-19024
MAGGIORI, D. N80-19705
MAGONE, M. E. N80-19905
MAGOURI, A. D. N80-19894
MAHAJAN, S. N80-19877
MAHAPATRA, A. N80-19947
MALLOY, B. E. N80-19215
MANGEZ, P. N80-19409
MANSKINE, P. J. N80-19276

MANHEIMER, W. M. N80-19958
MANK, R. M. N80-19835
MAO, C. P. N80-19283
MARASCHIN, R. A. N80-19825
MARCHAND, M. N80-19103
MARDER, J. M. N80-19249
MARDIKIAN, A. E. N80-19430
MARDO, J. G. N80-19879
MAREK, A. J. N80-19125
MARESCA, J. W., JR. N80-19403
MARINEPKA, R. J. N80-19330
MARK, A. N80-19036
MARKS, G. T. N80-19219
MARR, D. N80-19941
MARRS, R. W. N80-19803
MARSHALL, R. D. N80-19800
MARTEL, C. J. N80-19597
MARTIN, F. N80-19748
MARTIN, M. S. N80-19748
MARTIN, R. E. N80-19815
MARTIN, W. L. N80-19951
MARTINE, J. N80-19874
MASCLE, J. N80-19829
MASLIN, N. M. N80-19374
N80-19377
MASON, J. L. N80-19407
MASSEY, M. J. N80-19305
MASTEN, R. L. N80-19520
MASUOKA, T. N80-19929
MATHEWS, M. S., III N80-19067
MATSON, M. N80-19594
MATSUSHITA, M. J. N80-19625
MATTHEW, J. R. N80-19566
MATTIE, M. G. N80-19342
MAURER, S. J. N80-19343
MAXWELL, E. L. N80-20011
MAZIN, A. N. N80-19762
MCCARLEY, D. N80-19586
MCCLAIN, C. R. N80-19178
MCCLURPHA, A. J. N80-19820
MCCONNELL, R. D. N80-19845
MCDONALD, H. N80-19045
MCDONALD, R. A. N80-19542
MCDOWELL, T. R. N80-19579
MCGINNIS, D. F. N80-19594
MCIVER, A. E. N80-19296
MCKISSICK, A. M. N80-19669
MCLAUGHLIN, A. J. N80-20021
MCLEMORE, H. C. N80-19023
MCNALLY, G. W. N80-19455
MCWHORTER, A. L. N80-20021
MEAD, D. J. N80-19574
MECHOLSKY, J. J. N80-19267
MEEKS, M. L. N80-19364
MEI, C. C. N80-19637
MELLISH, J. A. N80-19179
MELMED, A. J. N80-19243
MELNIKOVA, Y. P. N80-19765
MEMMI, G. N80-19550
MENDES, A. S. N80-19399
MENDILLO, M. N80-19691
MERKEL, M. A. N80-19397
MEYER, G. N80-19126
MEYERSON, F. Z. N80-19782
MEZZINA, A. N80-19654
MICHLER, D. W. N80-19604
MICKELSEN, R. A. N80-19653
MIGLIORA, C. G. N80-19382
MIGNEAULT, G. E. N80-19541
MIKHALKINA, N. I. N80-19775
MILANOVICH, F. N80-19295
MILLARD, G. H. N80-19317
MILLER, D. R. N80-19513
MILLER, G. A. N80-19931
MILLER, M. D. N80-19084
MILLER, P. C. N80-19842
MILLER, T. Y. N80-19217
MILLIGAN, S. L. N80-19050
MILLMAR, G. H. N80-19380
MILLS, D. M. N80-19903
MILLS, K. A. N80-19972
MINEHART, R. C. N80-19932
MINICK, D. J. N80-19309
MINSKY, M. N80-19904
MINSTER, J. B. N80-19694
MIRIN, A. A. N80-19908
MISHIMA, J. N80-19867
MITCHELL, D. G. N80-19682
MITCHELL, R. E. N80-19789
MOATS, R. R. N80-19436
MOFFITT, J. V. N80-19267
MOHR, R. L. N80-19055
MOLTER, H. H. N80-19544
MONTBRIAND, L. E. N80-19591
MONTGOMERY, D. C. N80-19151
MONTGOMERY, R. C. N80-19186
MOORADIAN, G. C. N80-19344
MOORE, R. D. N80-19984
MOORE, R. L. N80-20001
MORABITO, P. B. N80-19869
MORETTI, G. N80-19457
MOREY, S. M. N80-19267
MORIMOTO, F. N80-19235
MORRIS, C. E. K., JR. N80-19033
MORRISON, F. R. N80-19509
MORROW, R. J. N80-19839
MOSELEY, J. T. N80-19224
MOSES, C. A. N80-19284
MOSHER, F. R. N80-19899
MOYER, V. N80-19737
MUBAYI, V. N80-19294
MUETHING, K. A. N80-19311
MUKHINA, N. N. N80-19772
MULCAY, W. N80-19030
MULDER, J. A. N80-19088
N80-19099
MURADOV, I. S. N80-19753
MURALIDHARAN, R. N80-19083
MURFF, S. J. N80-19805
MURGASH, K. N80-19759
MURRI, W. J. N80-19290
MURTHY, T. S. N80-19918
MYERS, V. I. N80-19580
N80-20008
MYHRE, J. N80-19923

N

NAEGELI, D. W. N80-19284
NANEVICZ, J. E. N80-19890
NAPPI, A. N80-19584
NARDUCCI, L. M. N80-19952
NARESKY, J. J. N80-19537
NASONOV, A. S. N80-19788
NAYLER, G. H. F. N80-19093
NEAL, B. F. N80-19315
NEIDWANDER, R. S. N80-19152
NELSON, E. V. N80-19825
NENNI, J. P. N80-19115
NEUGROSCHEL, A. N80-19809
NEUMAN, F. N80-19022
NEWMAN, J. N. N80-19837
NEWMAN, S. N80-19824
NEWMAN, T. N80-20019
NIARCHOS, D. N80-19973
NIEMEYER, W. A. N80-19825
NIEMOLLER, D. L. N80-19540
NIEVES, M. N80-19586
NIKITIN, Y. I. N80-19781
NIKITYUK, B. A. N80-19750
NIVER, E. N80-19348
NOHR, R. S. N80-19273
NOLEN, R. J. N80-19141
NORDSTROM, R. J. N80-19983
NORONHA, P. J. N80-19567
NOSSEIR, N. S. M. N80-19460
NVOTA, J. N80-19754

O

OBERMAN, A. N80-19789
OBRIEN, C. J. N80-19186
OCONNOR, P. D. T. N80-19524
OGAWA, A. N80-19111
OHTOMO, M. N80-19420
OLEARY, D. T. N80-19679
OLLER, T. L. N80-19119
OLSON, G. B. N80-19245
OLSON, J. H. N80-19292
OMERNIK, J. M. N80-19679
OMDRUSCH, A. N80-19994
ORLANSKY, J. N80-19830
ORMSBY, J. P. N80-19588
OSTASHEVA, N. Y. N80-19768
OSTERWEIL, L. J. N80-19981
OSTERYOUNG, J. G. N80-19223
OSTERYOUNG, R. A. N80-19223
OSTGAARD, J. C. N80-19840
OTT, E. N80-19857
OTT, R. H. N80-19350
N80-19352
OTTENS, H. H. N80-19573
OVERLY, P. T. N80-19625
OVERTURF, B. W. N80-19307
OWEN, E. W. N80-19446
OWENS, E. C. N80-19267
OWNBEY, J. W. N80-19709
OZAKI, R. N80-19236
OZKAYNAK, S. N80-19034

P

PACE, T. G. N80-19578
PACE, W. B. N80-19704
PAGE, C. L., JR. N80-19122
PAHLAVAN, K. N80-19316
PALABEK, T. A. N80-19473
PALAZZO, A. J. N80-19597
PALMER, E. A. N80-19792
PALMER, F. H. N80-19066
PAPADIMITRIOU, C. H. N80-19984
PAPET-LEPINE, J. N80-19099
PAPOULIS, A. N80-19326
PAPPERT, R. A. N80-19041
PARABONI, A. N80-19705
PARKER, G. L. N80-19162
N80-19163
PARKER, J. N80-19047
PARKS, G. K. N80-19685
PASHUKOV, Y. N. N80-19777
PASQUALE, J. D. N80-19520
PATIL, R. B. N80-19226
PAUL, A. K. N80-19381
PAUL, P. E. N80-19869
PAULIKOVA, E. N80-19773
PAULSON, M. R. N80-19328
PAVIER, J. D. N80-19548
PAVLOV, A. D. N80-19777
PAVLOVA, M. N. N80-19753
PAVONI, M. N80-19917
PAYNE, B. W. N80-19093
PAYNE, R. J. N80-19854
PEGG, R. J. N80-19023
PEKELIS, Y. M. N80-19680
PERKINS, J. R. N80-19125
PERKINS, P. R. N80-19076
PERRONE, T. J. N80-19720
PERSAKIS, T. N80-19674
PETERSON, V. C. N80-19239
PETROV, C. N80-19261
PETROVSKIY, K. S. N80-19794
PETTENGILL, R. C. N80-19949
PHALLER, L. J. N80-19538
PHELPS, J. N80-19444
PHILLIPS, E. J. N80-19576
PHINNEY, D. E. N80-19587
PICKRELL, A. J. N80-19746
PILLSBURY, R. D., JR. N80-19443
PINCUS, P. A. N80-19721
PIRVICS, J. N80-19509
PLAETSCHKE, E. N80-19097
PLANTARD, J. P. N80-19528
PLATZER, M. F. N80-19042
N80-19074
PLETCHER, J. H., JR. N80-19079
POCIWKI, L. S. N80-19200
POGGIO, E. N80-19027
POLK, J. F. N80-19689
POLYDOROS, A. N80-19322
PONGRATZ, H. W. N80-19841
PONTIUS, D. H. N80-19571
POSTNIKOV, V. S. N80-19790
POTAPOVICH, G. M. N80-19752
POTTER, R. M. N80-19589
POULTON, C. E. N80-20010
N80-20017
POWELL, H. M. N80-19135
N80-19187
POWELL, J. D., III N80-19800
POWERS, D. N80-19175
PRASLICKA, M. N80-19773
PRICE, G. R. N80-19805
PRICE, H. M. N80-19317
PRICE, L. L. N80-19135
N80-19187
PRIDE, R. A. N80-19198
PRINCE, S. W. N80-19046

PROBST, M. R. N80-19275
PROELSS, G. W. N80-19396
PROWSE, D. B. N80-19481
PRUETT, E. C. N80-19159
PUGH, P. G. N80-19139
N80-19140
PUHR-WESTERHEIDE, P. N80-19552
PURGOLD, G. C. N80-19894
PURTELL, L. P. N80-19475
PUTHOFF, R. L. N80-19814

Q

QADIR, A. N80-19877
QUATE, C. F. N80-19516
QUEMARD, C. N80-19139
QUINN, M. N80-19674

R

RABIE, R. L. N80-19482
RABURN, W. D. N80-19189
N80-19439
RAGHURAMAN, P. N80-19649
RAINEY, J. H. N80-19500
RAINEY, L. N80-19839
RAJPAUL, V. K. N80-19096
RAMACHANDRAN, S. N80-19081
RAMAKER, D. E. N80-19221
RAMEY, D. A. N80-19949
RAMSAY, L. M. N80-19481
RAO, N. R. N80-19384
RAPP, R. R. N80-19052
RAPPAPORT, S. N80-19945
RASSA, R. C. N80-19557
RATINO, D. A. N80-19089
RAULT, J. C. N80-19550
RAWER, K. N80-19387
RAWLINS, W. T. N80-19300
RAYSKIY, V. A. N80-19801
RAZDAN, M. K. N80-19289
RECH, K. D. N80-19349
REED, W. E. N80-19257
N80-19258
N80-19259
N80-19260
REEVE, G. R. N80-19310
REEVES, B. H. N80-19236
REEVES, F. N80-19173
REGAN, F. W., III N80-19325
REGULINSKI, T. L. N80-19525
REIDY, W. P. N80-19945
REINHERR, G. W. N80-19875
N80-19876
REINISCH, B. W. N80-19418
REITER, E. R. N80-19644
REKLAITIS, G. V. N80-19307
REPCHEKOVA, D. N80-19759
RHEE, S. S. N80-19618
RICCIARDI, B. V. N80-19375
RICE, R. R. N80-19484
RICE, R. W. N80-19267
N80-19277
RICE, W. C. N80-19801
RICH, C. N80-19868
N80-19891
RICHARDS, E. H. N80-19874
RICHARDS, R. N80-19839
RICHTER, P. H. N80-19834
RICHTOL, H. H. N80-19219
RIGNEY, R. A. N80-19824
RIMKUNAS, D. A. N80-19120
RIOS, A. N80-19598
RISBERG, J. A. N80-19185
RITTER, J. J. N80-19243
ROBERTS, A. N80-19829
ROBERTS, H. D. N80-19993
ROBERTSON, A. S. N80-19212
ROCHELLE, R. N80-19444
ROCK, S. M. N80-19117
RODRIGUEZ, G. N80-19169
ROELOF, E. C. N80-19682
ROETTGER, J. N80-19394
ROGERS, L. C. N80-19582
ROMAN, W. C. N80-19695
ROSENBERG, J. T. N80-19290
ROSENFELD, A. N80-19696
ROSENFIELD, D. N80-19201
ROSS, A. J. N80-19102
ROSS, B. N80-19619
ROSS, M. D. N80-19121
ROUNDY, J. S. N80-19123
ROURKE, M. D. N80-19942
ROUX, J. A. N80-19188
ROY, R. N80-19395
RUBIN, B. N80-19369
RUBINOVIC, B. C. N80-19313
RUBIO, R. N80-19397
RUDD, R. D. N80-20014
RUDDUCK, R. C. N80-19330
RUDDY, J. M. N80-19835
RUPPERT, D. N80-19920
N80-19922
RUSCHAU, J. J. N80-19242
RUSSELL, B. F. N80-19802
RUSTENBURG, J. W. N80-19370
RUTHERFORD, J. L. N80-19288
RYZHOV, N. I. N80-19767

S

SAEKS, R. N80-20019
SAFONOV, G. A. N80-19801
SAGANE, K. N80-19421
SAGERMAN, G. D. N80-19626
SAIB, S. H. N80-19814
SAKAGUCHI, J. L. N80-19606
SALEH, J. N80-19051
SALES, G. S. N80-19398
SALMIN, A. V. N80-19457
SAMARSKII, A. A. N80-19809
SAMET, H. N80-19882
SAMSON, J. A. R. N80-19929
SANDERS, H. N80-19621
SANDHAM, W. A. N80-19400
SAPP, P. W. N80-19362
SARAYEV, I. F. N80-19759
SARGENT, R. G. N80-19810
N80-19811
SARNA, K. R. N80-19678
SASAKI, Y. K. N80-19711
SAU, R. N80-19210
SAUNDERS, W. M. N80-19654
SAVAGE, R. N. N80-19225
N80-19955
SAVINA, V. P. N80-19761
N80-19774
SAWYER, R. F. N80-19108
SCHAEFER, H. J. N80-20002
SCHANSMAN, T. T. N80-19861
SCHECHTER, E. N80-19908
SCHEUCH, K. E. N80-19636
SCHIFF, K. L. N80-19514
SCHMER, F. A. N80-19593
SCHMIDT, G. T. N80-19843
SCHMIDT, S. F. N80-19055
SCHNABL, R. N80-19514
SCHNEBELE, K. J. N80-19057
SCHNEIDER, M. N80-19674
SCHOUTENS, J. E. N80-19474
SCHREYER, W. M. N80-19885
SCHRUMPF, B. J. N80-20017
SCHUBERT, F. H. N80-19800
SCHULLER, F. T. N80-19496
SCHULZ, G. N80-19097
SCHWARZ, W. W. N80-19227
N80-19228
SCHWERTZ, J. H. N80-19239
SCOGGINS, J. R. N80-19737
N80-19738
SCOTT, E. N80-19736
SEAGER, M. K. N80-19716
SEDOV, A. V. N80-19762
SEIDEL, D. B. N80-19405
N80-19413
SEIDEL, D. R. N80-19747
SELLERS, B. N80-19472
SELLERS, B. R. N80-19861
SELLIER, M. N80-19629
SENESAC, S. L. N80-19474
SENGUPTA, A. N80-19895
SENTMAN, L. H. N80-19487
SETTERLUND, R. H. N80-19843
SEWALL, J. L. N80-19563
SHAH, K. K. N80-19236
SHANAHAN, A. R. N80-19823
SHANE, R. S. N80-19253
SHANNON, R. W. N80-19269
SHAPCOTT, S. E. N80-19559
SHASHKOV, V. S. N80-19751
SHAYERSON, M. W. N80-19119
SHCHEGOLKOV, A. N. N80-19783
SHCHIRSKAYA, V. A. N80-19788
SHEALY, D. L. N80-19995
SHEARMAN, E. D. R. N80-19400
SHELLEY, E. G. N80-19887
SHELTON, R. D. N80-20000
SHENOY, G. K. N80-19973
SHEPHERD, O. N80-19945
SHEPPARD, C. H. N80-19208
SHIU, R. N80-19360
SHIMOU, H. N80-19235
SHIPMAN, J. S. N80-19801
SHIUE, J. C. N80-19360
SHNEIER, M. N80-19897
SHOCKEY, D. A. N80-19341
SHOCKEY, L. R. N80-19341
SHORE, J. E. N80-19898
SHORR, B. F. N80-19585
SHROBE, H. E. N80-19864
N80-19886
SHULZHENKO, Y. B. N80-19760
SICKLES, W. L. N80-19134
SIEGEL, H. J. N80-19852
SIKES, L. D. N80-19151
SIMONEN, F. A. N80-19939
SIMONEN, T. C. N80-19939
SIMONS, G. A. N80-19300
SIMONS, J. L. N80-19099
SIMPSON, M. R. N80-19308
SIRIE, E. O. N80-19702
SIRIGNANO, W. A. N80-19301
SIVACEK, V. I. N80-19313
SKAGGS, R. L. N80-19518
SKELTON, R. E. N80-19184
SLATE, S. C. N80-19939
SLATER, P. N. N80-20007
N80-20015
SLEMP, W. S. N80-19172
SMITH, C. C. N80-19089
SMITH, D. E. N80-19979
SMITH, E. F., III N80-19247
SMITH, G. A. N80-19126
SMITH, G. P. N80-19224
SMITH, O. C. N80-19229
SMITH, P. R. N80-19081
SMITH, R. A. N80-19482
SMITH, R. H. N80-19128
SMITH, S. D. N80-19852
SMITH, T. N80-19254
SMITH, W. B. N80-19671
SMOLIKA, A. J. K. N80-19217
SMOLIKA, S. N80-19845
SMOOT, L. D. N80-19303
SNYDER, R. E. N80-19132
N80-19689
SOBEK, A. A. N80-19688
SOFUE, Y. N80-19111
SOLOMIN, G. D. N80-19766
SOLOMON, J. S. N80-19280
SOLOVYEV, A. I. N80-19777
SOMERVILLE, P. N. N80-19707
N80-19709
N80-19717
N80-19722
N80-19950
SONI, Y. N80-19307
SOOD, M. K. N80-19307
SOS, J. H. P. N80-19422
SOUVARI, J. M. N80-19176
SPAFFORD, R. B. N80-19672
SPARACINO, C. M. N80-19309
SPENCER, S. G. N80-19802
SPICER, W. E. N80-19969
SPIELER, R. J. N80-19801
SPIERS, R. B., JR. N80-19155
SPRANGLE, P. N80-19482
SPRING, S. C. N80-19067
SPRINGER, C. N80-19291
STALFORD, H. L. N80-19061
N80-19072
N80-19073
STANLEY, W. L. N80-19084
STANZIONE, T. N80-19600
STARK, A. N80-19419
STARR, A. M. N80-19644
STARR, S. H. N80-19833

STATON, L. D. N80-19153
STAZHADZE, L. L. N80-19764
STECH, J. L. N80-19745
STEELE, G. L., JR. N80-19891
STEELY, S. L. N80-19450
STEFANOU, H. N80-19276
STEKLY, Z. J. J. N80-19443
STEURER, W. H. N80-19171
STEVENS, D. D. N80-19033
STEWART, D. C. N80-19121
STEWART, J. M. N80-19653
STIFEL, P. N80-19298
STILES, A. B. N80-19292
STOPPER, L. J. N80-19118
STOKES, J. W. N80-19159
STONE, R. W., JR. N80-19602
STOTTS, L. B. N80-19344
STRIEB, M. I. N80-19846
STRING, J. N80-19830
STRINGFELLOW, G. B. N80-19967
STUDER, P. A. N80-19424
STUPAKOV, G. P. N80-19753
SUKERT, A. N. N80-19551
SULLIVAN, J. S. N80-19674
SUN, D. F. N80-19327
SUNDSTROM, J. L. N80-19791
SUNG, C. S. P. N80-19269
N80-19272
SURKEN, M. N80-19248
SUROVTSEV, N. A. N80-19762
SUSSHOLZ, B. N80-19048
SUSSMAN, G. J. N80-19865
N80-19891
SWEENEY, L. E., JR. N80-19402
SWEETING, M. N. N80-19419
SWOROBOWICZ, C. J. N80-19827
SYCHEV, M. M. N80-19216
SYKES, G. F. N80-19172
SYTNIK, S. I. N80-19765
SZEBENYI, T. N80-19947
SZEKELY, G. A., JR. N80-19283
SZUSZCZEWICZ, E. P. N80-19958

T

TABACK, I. N80-19197
TACCONI, G. N80-19367
TAFF, L. G. N80-19177
TAKACS, P. Z. N80-19958
TAMIR, A. N80-19980
TANEYEVA, G. V. N80-19752
TANNER, R. L. N80-19415
TASHPULATOV, R. Y. N80-19757
TATTELMAN, P. N80-19725
TAYLOR, J. G. N80-19825
TAYLOR, J. T. N80-19132
TAYLOR, R. B. N80-19039
TAYLOR, R. L. N80-19826
TELFORD, L. E. N80-19336
TELIONIS, D. P. N80-19992
TENG, C. N80-19348
TENNEY, D. R. N80-19172
TEVIOVITZ, I. E. N80-19679
THERSBY, G. B. N80-19361
THIEBERGER, P. N80-19830
THODAY, R. D. C. N80-19317
THOMAS, C. N80-19320
THOMAS, E. C. N80-19398
THOMAS, J. B. N80-19889
THOMAS, M. E. N80-19683
THOMPSON, C. R. N80-19381
THOMPSON, V. R. N80-19239
THORSEN, F. N80-19368
TIEN, T. Y. N80-19209
TIGRANYAN, R. A. N80-19759
N80-19773
TIKHOFEYEV, Y. M. N80-19681
TIMOURIAN, H. N80-19295
TINDARE, L. V. N80-19750
TODD, P. N80-19782
TOLIVAR, A. F. N80-19183
TOMAINE, R. L. N80-19033
TONKIN, M. E. N80-19889
TORDA, T. N80-19759
TOROPTSOV, V. S. N80-19768
TOTSEVA, A. M. N80-19767
TOWER, J. R. N80-19437
TRIFONOV, M. I. N80-19681
TRIMBLE, W. C. N80-19180
TRONOLI, J. N. N80-19313
TROPPER, C. N80-19324
TROUBETZKOY, E. S. N80-19333
TRUEMAN, C. W. N80-19347
TSAI, S. W. N80-19208
TSANG, L. N80-19360
TSE, M. K. N80-19269
TSIPOURAS, P. N80-19174
TSO, S. T. N80-19214
TUCKER, C. J. N80-19590
TULLOCH, J. S. N80-19067
TUOVILA, S. M. N80-19838
TURCIO, C. M. N80-19985
TURKO, B. N80-19230
TURNEY, G. E. N80-19110
TURNQUIST, D. N80-19431

U

UGLOVA, N. N. N80-19765
UHM, H. S. N80-19936
ULLMAN, J. J. N80-20012
UTESHEV, A. B. N80-19752

V

VALANJU, P. N80-19877
VALENTINE, D. T. N80-19880
VANBUREN, R. N80-19983
VANESDONK, J. N80-19312
VANWOERKOM, K. N80-19098
VASILYEV, P. V. N80-19765
VERBRUGGE, R. A. N80-19103
VERDEYEN, J. T. N80-19480
VERGER, F. N80-19585
VERGHESE, G. N80-19902
VESSOT, R. F. C. N80-19999
VETTE, J. I. N80-19982
VICCARO, P. J. N80-19973
VIDOUSE, F. N80-19207
VIL-VILYAMS, I. F. N80-19760
VILA, P. N80-19399
VILLAGRA, H. M. I. N80-19745
VILNROTTER, V. A. N80-19323
VINH, N. X. N80-19026
VINOGRADOV, Y. A. N80-19801
VNUKOVA, Z. Y. N80-19776
VOGT, H. J. N80-19295
VOISINET, R. L. P. N80-19481
VOLLTRAUER, H. N. N80-19670
VOLOSHKO, N. A. N80-19752
VOLOZHIN, A. I. N80-19751
N80-19753
VONKERCZEK, C. H. N80-19458
VOROBYEV, V. Y. N80-19764
VORONINA, S. C. N80-19764

W

WADA, B. K. N80-19578
WAFFORD, J. H. N80-19091
WAGNER, D. A. N80-19135
WAGNER, R. N80-19485
WAGNER, R. S. N80-19484
WAGONER, D. E. N80-19309
WAHL, M. K. N80-19076
WAIT, J. R. N80-19405
N80-19410
N80-19412
N80-19413
WALKER, W. J. N80-19166
WALKUP, J. N80-20019
WALLER, J. T., JR. N80-19568
WALSH, E. J. N80-19332
WALTER, C. H. N80-19330
WALTERS, R. V. N80-19129
WALZ, J. E. N80-19156
WANG, A. S. D. N80-19211
WANG, T. P. N80-19584
WARD, C. J. N80-19840
WARD, F. E. N80-19066
WARD, J. C., JR. N80-19145
WARD, J. F. N80-19189
WARD, R. C. N80-19910
WARNER, D. A. N80-19107
WASH, C. H. N80-19718
WASHBURN, T. W. N80-19402
WASYLENKO, W. J., JR. N80-19310
WATERS, R. C. N80-19986
WAWERSIK, W. R. N80-19896
WEARMOUTH, W. R. N80-19234
WEATHERFORD, W. D., JR. N80-19267
WEAVER, D. P. N80-19191
WEBER, C. L. N80-19322
WEEKS, W. L. N80-19339
WEIDE, W., JR. N80-19307
WEIGEL, P. N80-19563
WEIKE, A. N80-19531
WEINSTEIN, R. H. N80-20009
WEISS, D. N80-19968
WELDON, R. N80-19712
WELLER, K. N80-19441
WELLS, K. N80-19826
WELP, D. N80-19838
WELSH, L. B. N80-19839
WERNIK, A. W. N80-19690
WERSCHULZ, A. N80-19911
WEST, A. E. N80-19982
WEST, S. N80-19880
WESTLAKE, D. G. N80-19973
WHALEN, J. A. N80-19389
WHITE, A. P. N80-19548
WHITE, I. L. N80-19655
WHITE, L. J. N80-19876
WHITMAN, G. M. N80-19943
WHITTAKER, T. M. N80-19719
WIESNET, D. R. N80-19594
WIKER, R. L. N80-19851
WILCOX, D. C. N80-19449
WILHELM, H. R. N80-19818
WILHELM, K. N80-19104
WILKINSON, C. R. N80-19307
WILLER, D. C. N80-19851
WILLETT, T. J. N80-19843
WILLIAMS, W. D. N80-19135
WILLSKY, A. S. N80-19902
WILTON, M. E. N80-19134
WINGENBACK, W. N80-19612
WINSTON, P. H. N80-19793
WINTERSTEINER, P. N80-19337
WISE, R. A. N80-19264
WOLANSKI, Z. R. N80-19567
WOLFSON, R. G. N80-19823
WOOD, H. A. N80-19085
WOOD, K. E. N80-19488
WOOD, R. E. N80-19189
WOOD, T. E. N80-19264
WOODHAM, R. J. N80-19596
WOODHOUSE, T. J. N80-19376
WOODS, A. A., JR. N80-19146
WOODS, W. M. N80-19522
WOODWARD, W. J., JR. N80-19478
WOSCHNI, G. N80-19484
WRIGHT, B. R. N80-19287
WRIGHT, C. E. N80-19175
WRIGHT, J. W. N80-19361
WU, A. N80-19877
N80-19886
WU, H. C. N80-19584
WUNDERLICH, G. N80-19834
WUNSCHMANN, H. J. N80-19819
WYATT, P. J. N80-19885
WYNNE, K. J. N80-19273

Y

YABLOCHKIN, V. D. N80-19766
YAKHNOVA, Y. N80-19759
YAKIMENKOV, L. I. N80-19780
YAMPOLSKY, J. S. N80-19482
YANG, D. N80-19130
YANGAGAWA, S. N80-19420
YAVORSKAYA, I. M. N80-19452
YEAGER, R. B. N80-19089
YEGOROV, B. B. N80-19751
YEH, K. C. N80-19384
YERMOLYEV, V. A. N80-19750
YIP, M. C. N80-19584
YORK, T. M. N80-19686
YOUNG, J. P. N80-19166
YUN, D. Y. Y. N80-19901
YURCZYK, R. F. N80-19068

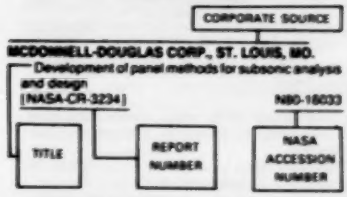
Z

ZACZEPINSKI, S. N80-19304

ZAVOLI, W. B. N80-19402
ZEHNPFENNIG, T. F. N80-19945
ZHURAVLEV, V. V. N80-19781
ZILKO, J. L. N80-19665
ZIMMERMAN, D. D. N80-19150
ZIMMERMANN, H. N80-19092
ZOCK, K. O. H. N80-19932
ZIZKA, G. N80-19230
ZUHL, B. E. N80-19862
ZUNIGA, M. N80-19360
ZYKOV, P. M. N80-19790

CORPORATE SOURCE INDEX

Typical Corporate Source Index Listing



Listings in this index are arranged alphabetically by corporate source. The title of the document provides the user with a brief description of the subject matter. The report number helps to indicate the type of document cited (e.g., NASA report, translation, NASA contractor report). The NASA accession number denotes the number by which the citation is identified. The titles are arranged under each corporate source in ascending accession number order.

A

ACUREX CORP., MOUNTAIN VIEW, CALIF.
Low-costs point-focus solar concentrator, phase 1
[NASA-CR-162839] N80-19625

ADDIS TRANSLATIONS INTERNATIONAL, PORTOLA VALLEY, CALIF.
Solutions to wave equations using an artificial viscosity method
[UCRL-TRANS-11492] N80-19909

ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT, NEUILLY-SUR-SEINE (FRANCE).
Special topics in HF propagation
[AGARD-CP-263] N80-19372
Avionics Reliability, Its Techniques and Related Disciplines
[AGARD-CP-261] N80-19519
Damping Effects in Aerospace Structures
[AGARD-CP-277] N80-19572

ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT, PARIS (FRANCE).
Propulsion and energetics panel Working Group 11 on aircraft fire safety. Volume 2: Main report
[AGARD-AR-132-VOL-2] N80-19047
Dynamic Environmental Qualification Techniques
[AGARD-R-682] N80-19090
Parameter Identification
[AGARD-LS-104] N80-19094
Toward new transonic windtunnels
[AGARD-AG-240] N80-19137
Terrain profiles and contours in electromagnetic wave propagation
[AGARD-CP-269] N80-19345
Modeling and Simulation of Avionics Systems and Command, Control and Communications systems
[AGARD-CP-268] N80-19809

AEG-TELEFUNKEN, ULM (WEST GERMANY).
Introduction to software reliability: A key issue of computing systems reliability N80-19547

AEROCHEM RESEARCH LABS., INC., PRINCETON, N. J.
Mobile source NOx monitor, hydrogen-atom direct chemiluminescence method
[PB80-102759] N80-19670

AERODYNE RESEARCH, INC., BEDFORD, MASS.
Nitric oxide ion and uranium oxide ion studies
[AD-A077870] N80-19688

AEROJET LIQUID ROCKET CO., SACRAMENTO, CALIF.
Orbital Transfer Vehicle (OTV) advanced expander cycle engine point design study
[NASA-CR-161389] N80-19179
Advanced oxygen-hydrocarbon rocket engine study
[NASA-CR-161390] N80-19186

AERONAUTICAL SYSTEMS DIV., WRIGHT-PATTERSON AFB, OHIO.
Development of a normalized probability distribution for lateral load factors due to aircraft ground turning
[AD-A077047] N80-19070
Application of MIL-STD-810C dynamic requirements to USAF avionics procurements N80-19091

AEROSPACE CORP., EL SEGUNDO, CALIF.
Failure analysis and resin evaluation if IUS SRM-1 92 inch prototype motor case
[AD-A077407] N80-19189

AEROSPACE MEDICAL RESEARCH LABS., WRIGHT-PATTERSON AFB, OHIO.
Spatial filtering and mechanisms of perception
[AD-A077822] N80-19788
Display Working Group Joint DARCOM/NMC/AFLC/AFSC Panel on the Field of Night Vision Technology
[AD-A077061] N80-19951

AIR FORCE AERO PROPULSION LAB., WRIGHT-PATTERSON AFB, OHIO.
An analytical and experimental study of aircraft hydraulic lines including the effect of mean flow
[AD-A079746] N80-19079
A computer program for estimating aircraft landing distance
[AD-A077159] N80-19088

AIR FORCE AVIONICS LAB., WRIGHT-PATTERSON AFB, OHIO.
Airborne measurements of electromagnetic wave reflections from land and sea water N80-19355
Tri-bar reading correction for oblique imagery
[AD-A078340] N80-19600
Avionics evaluation program: Simulation models for the effectiveness analysis of avionics N80-19838
A simulation support system, the development tool for avionic systems and subsystems N80-19840

AIR FORCE FLIGHT DYNAMICS LAB., WRIGHT-PATTERSON AFB, OHIO.
Recovery system preliminary design. A simplified approach to determining staging, timing and altitude requirements for fast inflating parachutes
[AD-A077548] N80-19041
USAF damage tolerant design handbook: Guidelines for the analysis and design of damage tolerant aircraft structures, revision A
[AD-A078216] N80-19085
Digital computer solution of aircraft longitudinal and lateral directional dynamic characteristics
[AD-A078672] N80-19088
The history of static test and Air Force structures testing
[AD-A077029] N80-19136
Transient thermal effects in disc brakes
[AD-A078735] N80-19505
Air Force Flight Dynamics Laboratory fiscal year 1981. Technical objective document
[AD-A078973] N80-20020

AIR FORCE GEOPHYSICS LAB., HANSCOM AFB, MASS.
Spacecraft charging model: Two Maxwellian approximation
[AD-A077907] N80-19174
Characteristics of the high latitude ionosphere produced by auroral particle precipitation N80-19389
Preliminary assessment of an automated system for detecting present weather
[AD-A078031] N80-19706
Climatic chamber tests of a surface ice accretion measurement system
[AD-A077022] N80-19725
Circus particle distribution study, part 5
[AD-A077361] N80-19741

AIR FORCE INST. OF TECH., WRIGHT-PATTERSON AFB, OHIO.
Thrust vectoring to eliminate the vertical stabilizer
[AD-A079852] N80-19077
Minimum time turns with thrust reversal
[AD-A079851] N80-19078
An analysis and synthesis of engine condition monitoring systems
[AD-A077531] N80-19122
Evaluation of and recommended change to the Reliability Improvement Warranty (RIW) guidelines
[AD-A077672] N80-19518
Markovian availability model for a network of communicating computers N80-19525

AIR FORCE MATERIALS LAB., WRIGHT-PATTERSON AFB, OHIO.
TI-59 magnetic card calculator solutions to composite materials formulas
[AD-A078043] N80-19208
ISS-SIMS surface characterization of smut on stainless steel
[AD-A078122] N80-19238
Contamination of the anode and cathode in phosphoric acid anodizing electrolytes
[AD-A077885] N80-19240
Formation of porous films on titanium alloys by anodization treatments
[AD-A077676] N80-19244
Characterization of tungsten dispenser cathodes using ISS and SIMS
[AD-A077592] N80-19428
An analysis of residual stresses and displacements due to radial expansion of fastener holes
[AD-A078370] N80-19569
Viscoelastic damping in USAF applications N80-19582
Characterization of LPE grown HgCdTe by ion scattering spectrometry
[AD-A077884] N80-19968

AIR FORCE PACKAGING EVALUATION AGENCY, WRIGHT-PATTERSON AFB, OHIO.
Evaluation of a polyurethane/polystyrene composite cushioning material
[AD-A077918] N80-19271

AIR FORCE WEAPONS LAB., KIRTLAND AFB, N. MEX.
Microcracks and metallization burnout
[AD-A078019] N80-19430
CLOUDS
[AD-A078363] N80-19716

AIR WEATHER SERVICE, SCOTT AFB, ILL.
Satellite training course notes. Part 4: Cloud patterns and the upper air wing field
[AD-A077557] N80-19712
An investigation of radar returns and their relationship to severe weather occurrences
[AD-A078858] N80-19714

AIRESEARCH MFG. CO., PHOENIX, ARIZ.
Demonstration program for a flexible duct valve for ramjet engine fuel controls
[AD-A078529] N80-19123

AKRON UNIV., OHIO.
Effect of number of chemical bonds on the strength of adhesion between glass and polybutadiene
[AD-A078237] N80-19274

ALABAMA UNIV., UNIVERSITY.
Solid-state switch modeling N80-19169

Development of mathematical models for solid state switching devices
[NASA-CR-161367] N80-19426

ALABAMA UNIV. IN HUNTSVILLE.
Magnetospheric research
[NASA-CR-161410] N80-19684

AMERICAN CHEMICAL SOCIETY, WASHINGTON, D. C.
Proceedings of the National Symposium on Wear and Corrosion
[AD-A077406] N80-19253

AMERICAN INST. OF AERONAUTICS AND ASTRONAUTICS, NEW YORK.
The 4th International Symposium on Air Breathing Engines
[AD-A078908] N80-19114

ANALYTIC SCIENCES CORP., READING, MASS.
E-3A navigational computer system real-time environmental simulator N80-19924

ANALYTICAL MECHANICS ASSOCIATES, INC., MOUNTAIN VIEW, CALIF.
Navigation systems for approach and landing of VTOL aircraft
[NASA-CR-152335] N80-19095

APPLIED PHYSICS LAB., JOHNS HOPKINS UNIV., LAUREL, MD.
Evolution of the orbital improvement program
[AD-A078842] N80-19143
Crystal-controlled projectile telemetry transmitter
[AD-A078214] N80-19180
Coronal magnetic structure and the latitude and longitude distribution of energetic particles, 1-5 AU
[NASA-CR-161391] N80-19682

ARGONNE NATIONAL LAB., ILL.
Environmental and economic evaluations of energy recovery from agricultural and forestry residues
[ANL/EES/TM-58] N80-19668
On the role of the atmospheric zonal index cycle in solar/terrestrial coupling
[CONF-7906119-1] N80-19697
Mossbauer effect investigations of the electronic and magnetic properties of rare earth metals and intermetallic hydrides
[CONF-790738-4] N80-19973

ARINC RESEARCH CORP., ANNAPOLIS, MD.
Avionics interface data summaries: A-10A, EF-111A, F-4G, F-4G, F-15A, F-18A, F-111A, F-111E, F-111F, RF-4C
[AD-A077388] N80-19105
Reliability improvement warranty: An overview N80-19527
The reliability improvement warranty and its application to the F-16 multinational fighter program N80-19561

ARIZONA UNIV., TUCSON.
A multidisciplinary approach to remote sensing education N80-20007
The pointable multispectral linear array system and the large format camera for early 1980 shuttle payloads N80-20015

ARKANSAS UNIV., FAYETTEVILLE.
Evaporation and dispersion of hazardous materials
[AD-A077399] N80-19291

ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND, DOVER, N. J.
Bayesian Interactive Graphics Reliability Assessment Procedure (BIGRAP)
[AD-A077641] N80-19878

ARMY AVIATION ENGINEERING FLIGHT ACTIVITY, EDWARDS AFB, CALIF.
Preliminary Airworthiness Evaluation UH-1H helicopter equipped with Multiple Target Electronic Warfare System (MULTEWS)
[AD-A078476] N80-19067

ARMY AVIONICS RESEARCH AND DEVELOPMENT ACTIVITY, FORT MONMOUTH, N. J.
Modern HF communications for low flying aircraft N80-19375
Military adaption of a commercial VOR/ILS airborne radio with a reliability improvement warranty N80-19540

ARMY COLD REGIONS RESEARCH AND ENGINEERING LAB., HANOVER, N. H.
Prototype overland flow test data: June 1977 - May 1978
[AD-A078743] N80-19597

ARMY COMMAND AND GENERAL STAFF COLL., FORT LEAVENWORTH, KANSAS.
The F-16 Wild Weasel: A feasibility study
[AD-A077050] N80-19071
Lightweight pilot helmets: The issue of weight versus protection
[AD-A078325] N80-19806

ARMY COMMUNICATIONS COMMAND, FORT HUACHUCA, ARIZ.
A sporadic E prediction technique N80-19597

ARMY COMMUNICATIONS-ELECTRONICS ENGINEERING INSTALLATION AGENCY, FORT HUACHUCA, ARIZ.
Standard engineering installation package, Air Traffic Radio Channel Control (ATRCC) equipment
[AD-A077648] N80-19059

ARMY ELECTRONICS RESEARCH AND DEVELOPMENT COMMAND, FORT MONMOUTH, N. J.
Development of the neodymium pentaphosphate (NPP) laser
[AD-A078603] N80-19486

ARMY ELECTRONICS RESEARCH AND DEVELOPMENT COMMAND, WHITE SANDS MISSILE RANGE, N. MEX.
The visiocolorimeter: A portable cloud height and visibility indicator
[AD-A078332] N80-19713

ARMY MATERIALS AND MECHANICS RESEARCH CENTER, WATERTOWN, MASS.
Fatigue strength of trip steels
[AD-A078592] N80-19245
Characteristics of mechanically fastened joints of CIP/HIP-1 Beryllium
[AD-A078275] N80-19500

ARMY MILITARY PERSONNEL CENTER, ALEXANDRIA, VA.
Delta7: A computer model of Delta growth
[AD-A077053] N80-19692

ARMY RESEARCH INST. FOR THE BEHAVIORAL AND SOCIAL SCIENCES, ALEXANDRIA, VA.
Helicopter pilot detection of the two different camouflaged hawk batteries
[AD-A077954] N80-19803

ARO, INC., ARNOLD AIR FORCE STATION, TENN.
Wind tunnel test to investigate aerodynamic hysteresis phenomena of the F-4 and F-11 aircraft models
[AD-A077196] N80-19040
Analytic and numerical investigation of the convergence for the adaptive-wall concept
[AD-A078203] N80-19134
Laser-Raman flow-field diagnostics of two large hypersonic test facilities
[AD-A078289] N80-19135
Bipropellant engine plume contamination program. Volume 2: Chamber measurements, phase 2
[AD-A077435] N80-19187
Bipropellant engine plume contamination program. Volume 1: Chamber measurements, phase 1
[AD-A078412] N80-19188
Experimental studies of multiple-scattered light from latex spheres
[AD-A078322] N80-19191

ASSOCIATION FOR UNMANNED VEHICLE SYSTEMS, DAYTON, OHIO.
Proceedings of the Association for Unmanned Vehicle Systems AUVS '79: 6th Annual Convention
[AD-A077677] N80-20018

ASTRO RESEARCH CORP., CARPINTERIA, CALIF.
The geometry of the 37-tile microwave antenna support structure
[NASA-CR-162847] N80-19321

ATLANTIC RESEARCH CORP., ALEXANDRIA, VA.
Turbulent boundary-layer analysis and experimental investigation of erosive burning problem of composite solid propellants
[AD-A077361] N80-19289
Evaluation of methodology and prototype to measure atmospheric sulfuric acid
[PB80-107055] N80-19669

ATMOSPHERIC SCIENCES LAB., WHITE SANDS MISSILE RANGE, N. MEX.
A sporadic E prediction technique N80-19397
The 19702A GSRS, missile number 310, round number B-33, 27 August 1979
[AD-A079990] N80-19726
The 19702A GSRS, Missile Number BR-3, Round Number B-35, 31 August 1979
[AD-A079991] N80-19727
The 19702A GSRS, missile numbers 308, 309, round numbers B-31, B-32, 18 August 1979
[AD-A079992] N80-19728
The 19306B GSRS, Missile Numbers 1043, 1045, Round Numbers V-64, V-65, 17 August 1979
[AD-A079993] N80-19729
The 19070ZA GSRS, Missile Number 004, Round Number B-30, 17 August 1979
[AD-A079989] N80-19730
The 19702D GSRS, Missile Number 023, Round Number B-38, 8 September 1979
[AD-A080000] N80-19731
The 12821A Lance, Missile Number 4819, Round Number 335 NCL, 13 August 1979
[AD-A079995] N80-19732
The 19702A GSRS, missile number 311, round number B-39, 10 September 1979: Meteorological Data Report
[AD-A080001] N80-19733
The 19304D GSRS, missile number 1063, round number V-67, 29 August 1979: Meteorological Data Report
[AD-A080002] N80-19734

AUTONETICS, ANAHEIM, CALIF.
Solid state power controller verification studies
[AD-A078238] N80-19429
Flat bus fault sensors
[AD-A077080] N80-19435

AXIOMATIX, LOS ANGELES, CALIF.
Ku-band radar threshold analysis
[NASA-CR-160557] N80-19322
Critique of a Hughes shuttle Ku-band data sampler/bit synchronizer
[NASA-CR-160556] N80-19427

B

BALLISTIC RESEARCH LABS., ABERDEEN PROVING GROUND, MD.
Free-flight base pressure measurements on 9 deg cones
[AD-A075365] N80-19036
Navier-Stokes solutions for spin-up from rest in a cylindrical container
[AD-A077115] N80-19455
Special function solutions of the diffusion equation
[AD-A075324] N80-19899
The theoretical treatment of particle swarms
[AD-A078218] N80-20000

BARDON ENVIRONMENTAL CONSULTANTS, INC., BIRMINGHAM, ALA.
Analysis of NOAA-MSFC GOES X-ray telescope
[NASA-CR-161397] N80-19995

BARRY RESEARCH CORP., SUNNYVALE, CALIF.
Real-time adaptive HF frequency management N80-19376

BATTELLE COLUMBUS LABS., OHIO.
Hydrogen in HY-130 weld metal
[AD-A077574] N80-19508
Avionics evaluation program: Simulation models for the effectiveness analysis of avionics N80-19838

BATTELLE PACIFIC NORTHWEST LABS., RICHLAND, WASH.
Alaskan environmental research. Section 12.0 of part 2: Ecological sciences
[PNL-2950-PT-2-SUPPL] N80-19666
Mathematical models for atmospheric pollutants. Appendix B: Chemical and physical properties of gases and aerosols
[EPRI-EA-1131-APP-B] N80-19667
Stress analysis of high-level waste canisters: Methods, applications, and design data
[PNL-3036] N80-19839

BAYLOR UNIV., WACO, TEX.
An improved dispersion system for simultaneous multielement analysis by flame spectroscopy N80-19215

BELL TELEPHONE LABS., INC., MURRAY HILL, N. J.
Why do glassy materials possess energy gaps
[AD-A078668] N80-19656

BEKXIX CORP., KANSAS CITY, MO.
Mechanical properties of electroplated nickel rings for bath aging study
[BDX-613-2303] N80-19258
Figure-of-merit for bare and coated wires and flat ribbon jumpers
[BDX-613-2304] N80-19445

BIHRLE APPLIED RESEARCH, INC., JERICHO, N. Y.
Rotary balance data for a typical single-engine general aviation design for an angle-of-attack range of 8 deg to 90 deg. 1: Low-wing model A
[NASA-CR-3100] N80-19030
BIONETICS CORP., HAMPTON, VA.
Evaluation of equipment vulnerability and potential shock hazards N80-19157
Surveys of facilities for the potential effects from the fallout of airborne graphite fibers N80-19199
BIRMINGHAM UNIV. (ENGLAND).
Ground-wave and sky-wave sea-state sensing experiments in the United Kingdom N80-19400
BOEING AEROSPACE CO., SEATTLE, WASH.
New remotely piloted vehicle launch and recovery concepts. Volume 1: Analysis, preliminary design and performance/cost trade studies
[AD-A077475] N80-19066
Large space systems technology electronics: Data and power distribution N80-19168
Quality control developments for graphite/PMR15 polyimide composites materials
[NASA-CR-159182] N80-19206
Solar power satellite system definition study. Volume 3: Operations and systems synthesis, phase 2
[NASA-CR-160480] N80-19616
Solar power satellite system definition study. Volume 1, phase 2: Executive summary
[NASA-CR-160540] N80-19631
Emerging materials systems for solar cell applications-Cu/sub 2-x/Se
[DOE/ET-23005-T2] N80-19653
A JTIDS performance model for the E-3A N80-19825
BOEING CO., WICHITA, KANS.
Developing, mechanizing and testing of a digital active flutter suppression system for a modified B-52 wind-tunnel model
[NASA-CR-159155] N80-19566
BOEING COMMERCIAL AIRPLANE CO., SEATTLE, WASH.
NASA TLA workload analysis support. Volume 1: Detailed task scenarios for general aviation and metering and spacing studies
[NASA-CR-3199] N80-19791
BOEING COMPUTER SERVICES, INC., SEATTLE, WASH.
Distribution data base design
[EPRI-EL-1150-VOL-1] N80-19655
Distribution data base design
[EPRI-EL-1150-VOL-2] N80-19656
Distribution data base design
[EPRI-EL-1150-VOL-3] N80-19657
BOEING ENGINEERING AND CONSTRUCTION, SEATTLE, WASH.
Low cost point focus solar concentrator, phase 1
[NASA-CR-162848] N80-19624
BOEING MILITARY AIRPLANE DEVELOPMENT, SEATTLE, WASH.
Easy ACLS dynamic analysis, volume 2. Part 2: Component computer programs
[AD-A079803] N80-19076
BOLT, BERANEK, AND NEWMAN, INC., CAMBRIDGE, MASS.
Closed loop models for analyzing engineering requirements for simulators
[NASA-CR-2965] N80-19063
BOSTON COLL., CHESTNUT HILL, MASS.
Numerical and data analysis techniques applied to scientific research, 3
[AD-A075383] N80-19574
BOSTON UNIV., MASS.
DMSP auroral images and the Goose Bay ionosphere
[AD-A077023] N80-19691
Modeling and flight simulation of an active configured aircraft under M.L.S. guidance N80-19845
BRIGHAM YOUNG UNIV., PROVO, UTAH.
Mixing and gasification of coal in entraining flow systems
[FE-2986-T1] N80-19303
BRITISH AEROSPACE AIRCRAFT GROUP, BRISTOL (ENGLAND).
Civil aircraft equipment environment qualification techniques N80-19093
BRITISH AEROSPACE AIRCRAFT GROUP, BROUGH (ENGLAND).
Some recent measurements of structural dynamic damping in aircraft structures N80-19576
The role of the aircraft model in avionic systems simulation N80-19837
BRITISH AEROSPACE DYNAMICS GROUP, BRISTOL (ENGLAND).
Some of the problems in digital terrain model construction N80-19361
Simulation for whole life development N80-19839
BRITISH AEROSPACE DYNAMICS GROUP, STEVENAGE (ENGLAND).
Micro-electronic systems reliability prediction N80-19524
BRITISH BROADCASTING CORP., KINGSWOOD (ENGLAND).
Synchronization of the radio-4 (UK) transmitter chain on 200 kHz
[BBC-RD-1979/27] N80-19317
COPAS: A high speed real-time digital audio processor
[BBC-RD-1979/26] N80-19485
Surface Acoustic Waves: Experimental device fabrication
[BBC-RD-1979/29] N80-19928
BRITISH LIBRARY LENDING DIV., BOSTON SPA (ENGLAND).
Prospects for broadening the range of inorganic binding agents
[RTS-11804] N80-19216
Practical electroplating properties of electrochemically deposited metal and alloy coatings. Part 1: Gold and gold alloys
[BLL-TRS-11923] N80-19233
Stability to heat treatment of nickel-manganese deposits containing sulphur
[BLL-RTS-11591] N80-19234
The liquidus surface of the aluminum-titanium-boron phase diagram at the aluminum corner
[BLL-RTS-11695] N80-19235
Activation by means of colloidal palladium in the electroplating of ABS copolymers. 2: The nature of the palladium/tin (2) chloride activating solution
[BLL-RTS-11924] N80-19261
Ways to inorganic polymers
[BLL-RTS-11805] N80-19262
Sealing techniques for ultra-high vacuum systems
[BLL-RTS-11856] N80-19312
Improving the performance and accuracy of external cylindrical grinding N80-19313
Adjacent-signal characteristics and co-channel interference of a land mobile lincompex system in the VHF band
[BLL-RTS-11914] N80-19318
S-BAND MIC TRAPATT amplifier
[BLL-RTS-11884] N80-19420
Monte Carlo simulation for integrated circuits
[BLL-RTS-11885] N80-19421
A mathematical investigation of the dynamic resistance of a DC electrical machine N80-19422
Miniature synchronous motors with permanent magnet rotors
[BLL-RTS-11801] N80-19423
A gas-sensitive semiconductor director for gas-chromatographic analysis
[BLL-RTS-11943] N80-19466
Laser vibration gyroscope
[BLL-RTS-11579] N80-19467
Experimental investigation into the heat flux in the piston and cylinder liner of a high-speed diesel engine
[BLL-RTS-11802] N80-19494
Testing the contact characteristics of electro-deposited coatings, part 1
[BLL-RTS-11808] N80-19514
Solving the non-linear equations of deep convection
[BLL-TRANS-1397-(9022.549)] N80-19680
Possibilities of using radiation in the oxygen absorption line at lambda = 2.53 mm on slant paths for thermal sounding of the atmosphere
[BLL-TRANS-1402-(9022.549)] N80-19681
Calculations using a model, of the seasonal variation in the concentration of nitrogen compounds in the temperate stratosphere
[BLL-TRANS-1400-(9022.549)] N80-19700
Methods for analysing the homogeneity of climatological series
[BLL-TRANS-1407-(9022.549)] N80-19701
Stability analysis of kinetic models of the global C-cycle: Exchange of carbon between land biota and atmosphere under the influence of man
[BLL-TRANS-1421-(9022.549)] N80-19702
BROOKHAVEN NATIONAL LAB., UPTON, N. Y.
Potential of biomass conversion in meeting the energy needs of the rural populations of developing countries: An overview
[BNL-26721] N80-19294
Electrolysis-based hydrogen storage systems overview and rationale of the Brookhaven National Laboratory managed program
[BNL-26904] N80-19654
Cluster effects on charge state distributions for heavy ion molecular beams
[BNL-26785] N80-19930
BROWN UNIV., PROVIDENCE, R. I.
Design of optimal tracking discrete control system
[AD-A078751] N80-19890
On the weak convergence of a sequence of general stochastic difference equations to a diffusion
[AD-A080082] N80-19900
BUNDESAMT FUER WEHRTECHNIK UND BESCHAFFUNG, KOBLENZ (WEST GERMANY).
Software quality and its assurance N80-19553
BUNKER-RAMO CORP., WRIGHT-PATTERSON AFB, OHIO.
Flight path displays
[AD-A077181] N80-19107

C

CALIFORNIA INST. OF TECH., PASADENA.
Body and surface wave modeling of observed seismic events
[AD-A078056] N80-19694
Empirical studies of solar flares: Comparison of X-ray and H alpha filtergrams and analysis of the energy balance of the X-ray plasma
[NASA-CR-161405] N80-20001
CALIFORNIA STATE DEPT. OF TRANSPORTATION, SACRAMENTO.
Evaluation and calibration of road meter devices for measuring pavement rideability
[PB80-110422] N80-19315
CALIFORNIA STATE UNIV., LONG BEACH.
The calculation of momentum and heat transfer in internal flows and in flows with small regions of separation
[AD-A078484] N80-19458
CALIFORNIA UNIV., BERKELEY.
Turbulence, combustion, pollutant, and stability characterization of a premixed, step combustor
[NASA-CR-3230] N80-19108
History and future of remote sensing technology and education N80-20004
Is remote sensing far out? N80-20005
CALIFORNIA UNIV., BERKELEY. LAWRENCE BERKELEY LAB.
X-ray absorption studies of graphite intercalates and metal ammonia solutions
[LBL-9840] N80-19212
The corrosion of silicate materials by hydrogen gas and hydrofluoric acid solution
[LBL-9887] N80-19214
CAMAC system for computer control of microwave spectrometers
[LBL-9276] N80-19230
Nonlinear wave evolution in VLASOV plasma: A lie-transform analysis
[LBL-8185] N80-19962
Determination of morphology and electronic structure in solids with 20-1000 eV radiation
[LBL-9482] N80-19971
Determinations of electronic states in crystalline semiconductors and metals by angle-resolved photoemission
[LBL-9429] N80-19972
CALIFORNIA UNIV., DAVIS.
A continuum model of protein transport across the endothelium in the lungs and in the body of humans N80-19778
Interframe adaptive data compression techniques for images
[AD-A078641] N80-19873
CALIFORNIA UNIV., IRVINE.
Experimental assessment of nitrogen oxides transformations while sampling combustion products
[AD-A078090] N80-19220

CALIFORNIA UNIV., LIVERMORE. LAWRENCE LIVERMORE LAB.
Methanol as a transportation fuel: Assessment of environmental and health research
[UCRL-52897] N80-19295
Definition of subsurface features by geophysical probing N80-19408
Detection of a normal zone in inductively coupled superconducting coils
[UCRL-83307] N80-19446
Note on normalization of variables and and equations
[UCID-18983] N80-19908
Solutions to wave equations using an artificial viscosity method
[UCRL-TRANS-11492] N80-19909
Magnetic mirror confinement of high-energy, high-density plasma
[UCRL-82780] N80-19959
Consequences of intensity constraints on inertial confinement fusion
[UCRL-83342] N80-19961

CALIFORNIA UNIV., LOS ANGELES.
On the use of simulation in the design and implementation of distributed systems
[AD-A078322] N80-19853

CALIFORNIA UNIV., SANTA BARBARA.
The attributes of a well-trained remote sensing technologist N80-20006

CALSPAN ADVANCED TECHNOLOGY CENTER, BUFFALO, N.Y.
Tests of an improved rotating stall control system on a J-85 turbojet engine
[AD-A077704] N80-19100
Basic studies of rotating stall in axial flow compressors
[AD-A077690] N80-19115
Aerodynamic and acoustic investigations of axial flow fan and compressor blade rows, including three-dimensional effects
[AD-A077712] N80-19116

CAMBRIDGE UNIV. (ENGLAND).
Visualization of unsteady jets and aerodynamic noise fields
[CUED/A-TURBO/TR-96] N80-19029

CARNEGIE-MELLON UNIV., PITTSBURGH, PA.
The chemistry of sulfur in char and the implications for hydrogasification/hydrodesulfurization
[FE-2449-8] N80-19298
Integrated optics for rf spectrum analysis and acoustic microscopy for the study of material joints N80-19940

CASE WESTERN RESERVE UNIV., CLEVELAND, OHIO.
Highly conducting iodinated fluoroaluminum and fluorogallium phthalocyanine polymers
[AD-A078188] N80-19273
Conduction in polydiacetylene bilayers
[AD-A078755] N80-19279

CATALYTIC, INC., PHILADELPHIA, PA.
Application of coke plant control technologies to coal conversion
[PB80-108054] N80-19310

CENTRAL MAINE POWER CO., AUGUSTA.
Cataract hydroelectric development expansion study
[DOE/ID-01796-1] N80-19650

CENTRE NATIONAL D'ETUDES DES TELECOMMUNICATIONS, ISSY-LES-MOULINEAUX (FRANCE).
Ionospheric effects of a solar eclipse in the Cape Verde Islands N80-19399

CENTRE NATIONAL D'ETUDES DES TELECOMMUNICATIONS, LANNION (FRANCE).
The influence of ionospheric models on calculations of decametric wave propagation N80-19383
On determining the Maximum Usable Frequency (MUF) N80-19388

CINCINNATI UNIV., OHIO.
Optical channel waveguide arrays coupled to integrated charge-coupled devices and their applications
[AD-A077394] N80-19949

CLAREMONT MENS COLL., CALIF.
Delta-exact lower confidence bounds for series system reliability
[AD-A077524] N80-19923

CLEMSON UNIV., S.C.
Method of forming dynamic membrane on stainless steel support
[NASA-CASE-MSC-18172-1] N80-19237

COASTAL ENGINEERING RESEARCH CENTER, FORT BELVOIR, VA.
A system for using radar to record wave direction
[AD-A078307] N80-19342

COLORADO ENERGY RESEARCH INST., GOLDEN.
Hydrogen and methane syntheses through radiation catalysis N80-19297

COLORADO RESEARCH AND PREDICTION LAB., BOULDER.
Loran-C pulse transient propagation. Part 1: Geophysical and geological data base evaluation for Loran-C ground wave propagation medium. Part 2: Loran-C ground wave secondary phase corrections over nonhomogeneous propagation techniques. Part 3: An experimental program to measure ECD and test the transient solution, with addendum
[AD-A077551] N80-19058

COLORADO STATE UNIV., FORT COLLINS.
Electrochemistry of solutes in chloroaluminate melts and the development of related electrochemical methodology
[AD-A078242] N80-19223
Modeling the space conditioning energy demand of a community as a function of weather
[COO-1340-65] N80-19644
Tropical cyclone origin, movement, and intensity characteristics based on data compositing techniques
[AD-A078624] N80-19739
Opportunities and problems in introducing or expanding the teaching of remote sensing in universities N80-20011

COLORADO UNIV., BOULDER.
A software lifecycle methodology and tool support
[AD-A076335] N80-19881

COLORADO UNIV. AT BOULDER.
Principles of HF communication in tunnels using open transmission lines and leaky cables N80-19405
Mode conversion by tunnel non-uniformities in leaky feeder communication systems N80-19413
The elastic and inelastic scattering of 0.8 GeV protons by Y-89 and Zr-90 N80-19934

COLT INDUSTRIES, INC., PITTSBURGH, PA.
Consolidation of titanium powder to near net shapes
[AD-A078039] N80-19239

COLUMBIA UNIV., NEW YORK.
Picosecond laser studies of aromatic radical ions
[AD-A078721] N80-19219

COMMITTEE ON SCIENCE AND TECHNOLOGY (U. S. HOUSE).
NASA authorization, 1981, program review, volume 2
[GPO-56-220] N80-19988

COMMUNICATIONS RESEARCH CENTRE, OTTAWA (ONTARIO).
The effects of re-radiation from high-rise buildings and transmission lines upon the radiation pattern of MF broadcasting antenna arrays N80-19347
VHF/UHF path-loss calculations using terrain profiles deduced from a digital topographic data base N80-19386
Direction and Doppler characteristics of medium and long path HF signals within the night-time sub-auroral region N80-19391
New technology to improve HF circuit reliability and availability for remote regions N80-19417

COMPUTER SCIENCES CORP., HUNTINGTON VALLEY, PA.
Microprocessor controlled ejection seat
[AD-A077479] N80-19049

CORNELL UNIV., ITHACA, N. Y.
Dispersion, patterned and structured matrices: Vec operators and related topics N80-19914
Investigation of higher order forbidden reflections in Si and Ge using synchrotron radiation N80-19983

CROUZET AEROSPACE AND SYSTEMS, VALENCE (FRANCE).
The increase of the reliability of electronic equipment subject to reliability clauses N80-19529

D

DAYTON UNIV. RESEARCH INST., OHIO.
Far field conditions for subsonic flows with small superimposed harmonic oscillations
[AD-A077693] N80-19043
Determination of test technique influence on K sub ISCC values for aluminum 7075-T651
[AD-A077453] N80-19242
Development of surface interactions at polymer-metal interfaces
[AD-A077276] N80-19280

DCW INDUSTRIES, STUDIO CITY, CALIF.
Recent improvements to the spinning body version of the EDDYBL computer program
[NASA-CR-152347] N80-19448

DEFENSE ADVANCED RESEARCH PROJECTS AGENCY, ARLINGTON, VA.
Aviation training using video disk technology N80-19829

DELAWARE UNIV., NEWARK.
Kinetics and mechanism of desulfurization and denitrogenation of coal-derived liquids
[FE-2028-15] N80-19292

DENVER UNIV., COLO.
Textbooks and technical references for remote sensing N80-20014

DEPARTMENT OF ENERGY, BARTLESVILLE, OKLA.
Physical properties of gasoline/alcohol blends
[BERC/RI-79/4] N80-19296

DEPARTMENT OF ENERGY, WASHINGTON, D. C.
Issues concerning the light-duty diesel
[DOE/EV-0050/1] N80-19510

DEPARTMENT OF THE AIR FORCE, WASHINGTON, D.C.
Representing human thought and response in military conflict simulation models N80-19813
Theater air defense engagement simulation-command/control/communications ns-C3): An approach to theater air defense model/methodology development N80-19817

DESMATICS, INC., STATE COLLEGE, PA.
An approach for providing more accurate probability assessments
[AD-A077994] N80-19979

DEUTSCHE BUNDESPOST, DARMSTADT (WEST GERMANY).
Theoretical distribution functions of multipath propagation and their parameters for mobile radio communication in quasi-smooth terrain N80-19358
Diffraction phenomena during multipath fading N80-19371

DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, BRUNSWICK (WEST GERMANY).
Aircraft parameter identification methods and their applications: Survey and future aspects N80-19095
Practical input signal design N80-19097
Rotorcraft identification experience N80-19101
Closed loop aspects of aircraft identification N80-19104

DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, GOETTINGEN (WEST GERMANY).
Effect of structural damping on the dynamic response of spacecraft N80-19577

DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, STUTTGART (WEST GERMANY).
Dynamic damping investigations on composites N80-19581

DEUTSCHE WELLE, COLOGNE (WEST GERMANY).
On the influence of surface statistics, ground moisture content and wave polarization on the scattering of irregular terrain and on signal power spectra N80-19359

DOUGLAS AIRCRAFT CO., INC., LONG BEACH, CALIF.
Evaluation of aircraft windshield materials in a simulated supersonic flight environment
[AD-A078573] N80-19082
Primary Adhesively Bonded Structure Technology (PABST). General material property data
[AD-A077691] N80-19268

DOW CORNING CORP., MIDLAND, MICH.
Develop silicone encapsulation systems for terrestrial silicon solar arrays
[NASA-CR-162840] N80-19817

DOWTY BOULTON PAUL LTD., WOLVERHAMPTON (ENGLAND).
Nonelectronic aspects of avionic system reliability N80-19535

DRAPER (CHARLES STARK) LAB., INC., CAMBRIDGE, MASS.
A fault tolerant architecture approach to avionics reliability improvement N80-19533
Cruise-missile-carrier navigation requirements N80-19843

DREXEL UNIV., PHILADELPHIA, PA.
Significance of large scatter of composite properties to aircraft reliability [AD-A077804] N80-19082
Development of quasi-homogeneous optical sources [AD-A079297] N80-19952

DU PONT DE NEMOURS (E. I.) AND CO., AIKEN, S. C.
Hydrogen effects on flow localization and fracture in type 304L stainless steel [DP-MS-79-57] N80-19255
Pulse height analyzer/oscilloscope display interface [DP-1534] N80-19478

DUKE UNIV., DURHAM, N. C.
Development of a laser-Doppler velocimeter for use in the aquatic environment N80-19479
Preparation and characterization of hydrogenated amorphous boron thin films and thin film solar cells produced by glow discharge decomposition methods [DOE/ET-2304-1] N80-19952
A recursion theoretic analysis of certain generalizations of Ramsey's theorem and of the Gale-Stewart theorem N80-19993

DYNA EAST CORP., WYNNEWOOD, PA.
Effects of proof-test on the strength and fatigue life of a unidirectional composite [AD-A076334] N80-19211

DYNAMICS RESEARCH CORP., WILMINGTON, MASS.
Application of the Estimation-Before-Modeling (EBM) system identification method to the high angle of attack/sideslip flight of the T-2C jet trainer aircraft. Volume 2: Simulation study using T-2C wind tunnel model data [AD-A079923] N80-19081
Application of the Estimation-Before-Modeling (EBM) system identification method to the high angle of attack/sideslip flight of the T-2C jet trainer aircraft. Volume 3: Identification of T-2C aerodynamics stability and control characteristics from actual flight test data [AD-A079924] N80-19072
Application of the Estimation-Before-modeling (EBM) system identification method to the high angle of attack/sideslip flight of the T-2C jet trainer aircraft. Volume 1: Executive summary [AD-A080025] N80-19073

E

EDGERTON, GERMESHAUSEN AND GRIER, INC., IDAHO FALLS, IDAHO.
Bruneau Known Geothermal Resource Area: An environmental analysis [EGG-GTH-5004] N80-19602

EDGERTON, GERMESHAUSEN AND GRIER, INC., SALEM, MASS.
Plasma cathode thyratron [AD-A078864] N80-19431

EIC, INC., NEWTON, MASS.
Investigations of the safety of Li/SOCl2 batteries [AD-A077894] N80-19835

EIKONIX CORP., BURLINGTON, MASS.
Analytical studies of phase estimation techniques, volume 1 [AD-A078006] N80-19944

ELECTRONIQUE MARCEL DASSAULT, ST. CLOUD (FRANCE).
Impacts of technologies selected on the reliability and operational availability of equipments. Cost considerations N80-19536
Simulation for integration with dynamic tests of the logical elements of principal onboard computers N80-19842

ELEKTRONIK-SYSTEM G.M.B.H., MUNICH (WEST GERMANY).
A simulation program for the determination of system reliability of complex avionic systems N80-19823
Design and simulation of a C3I system for surveillance purpose N80-19821

ELLIOTT-AUTOMATION SPACE AND ADVANCED MILITARY SYSTEMS LTD., CAMBERLEY (ENGLAND).
Reliability management of the avionic system of a military strike aircraft N80-19546
Software development for TORNADO: A case history from the reliability and maintainability aspect N80-19554

ENERGY AND ENVIRONMENTAL ANALYSIS, INC., ARLINGTON, VA.
Sources of atmospheric cadmium [PB80-121221] N80-19677

ENGINEERING SCIENCES DATA UNIT, LONDON (ENGLAND).
Undercarriage drag prediction methods [ESDU-79015] N80-19028
Estimation of the endurance of civil aircraft wing structures [ESDU-79024] N80-19060
Equilibrium temperatures in self-contained bearing assemblies. Part 5: Examples of the complete method [ESDU-79002] N80-19493

ENVIRONMENTAL PROTECTION AGENCY, RESEARCH TRIANGLE PARK, N.C.
An empirical approach for relating annual TSP concentrations to particulate microinventory emissions data and monitor siting characteristics [PB80-113758] N80-19676

ENVIRONMENTAL RESEARCH AND TECHNOLOGY, INC., CONCORD, MASS.
Comparative study of anomalous gray-shade patterns in DMSP and LANDSAT imagery [AD-A077902] N80-19595

ENVIRONMENTAL RESEARCH AND TECHNOLOGY, INC., WESTLAKE VILLAGE, CALIF.
User's guide to the ELSTAR photochemical air quality simulation model [PB80-109184] N80-19575

ENVIRONMENTAL RESEARCH INST. OF MICHIGAN, ANN ARBOR.
Synthetic aperture imaging techniques at short wavelengths [AD-A078720] N80-19336
Statistical analysis of terrain and water (ice) backgrounds in a winter scene from northern Michigan [AD-A077554] N80-19598
Statistical analysis of terrain and water backgrounds in the vicinity of Port Huaneme, California [AD-A077025] N80-19599

EXXON RESEARCH AND ENGINEERING CO., BAYTON, TEX.
Fluid coking of coal liquefaction residues: The fourth residue [FE-2422-28] N80-19304

F

FEDERAL AVIATION ADMINISTRATION, WASHINGTON, D. C.
Airborne radar approach system flight test experiment [AD-A077900] N80-19054
Nondestructive evaluation of airport pavements. Volume 2: Operational manual for PAVBEN program at TCC [AD-A079495] N80-19130

FEDERAL ELECTRIC CORP., VANDENBERG AFB, CALIF.
Range vernier [AD-A077178] N80-19335

FLORIDA STATE UNIV., GAINESVILLE.
Investigation of thermoplastic elastomers as propellant binders [AD-A078691] N80-19288

FLORIDA STATE UNIV., TALLAHASSEE.
Equatorial Pacific Ocean variability: Seasonal and El Nino times scales [AD-A077031] N80-19724
Randomization tests in support of some statistical analyses of a weather modification experiment [AD-A078336] N80-19736

FLORIDA UNIV., GAINESVILLE.
Vorticity associated with multiple jets in a crossflow [NASA-CR-162855] N80-19454
Studies of silicon p-n junction solar cells [NASA-CR-162832] N80-19609

FORSCHUNGSINSTITUT DER DEUTSCHEN BUNDESPOST, DARMSTADT (WEST GERMANY).
Comparison of measured and predicted MUF's at a remote location N80-19378

FORSCHUNGSINSTITUT FUER FUNK UND MATHEMATIK, WERTHOVEN (WEST GERMANY).
Objectives for building an experimental CCIS N80-19815

FOSTER-MILLER ASSOCIATES, INC., WALTHAM, MASS.
Analysis of trunk flutter in an air cushion landing system [AD-A079008] N80-19075

FWG ASSOCIATES, INC., TULLAHOMA, TENN.
Monodisperse atomizers for agricultural aviation applications [NASA-CR-159777] N80-19450
Fog dispersion [NASA-CR-3255] N80-19703

G

GAERTNER (W. W.) RESEARCH, INC., STAMFORD, CONN.
Programming support library. Volume 1: Functional requirements [AD-A078436] N80-19985

GANNETT, FLEMING, CORDDRY AND CARPENTER, INC., HARRISBURG, PA.
Evaluation of operation and maintenance factors limiting biological wastewater treatment plant performance [PB80-108947] N80-19993

GENERAL ACCOUNTING OFFICE, WASHINGTON, D. C.
Federal weather modification efforts need congressional attention [PB80-108511] N80-19742

GENERAL ATOMIC CO., SAN DIEGO, CALIF.
Tubing for augmented heat transfer [GA-A-15442] N80-19482

GENERAL DYNAMICS/CONVAIR, SAN DIEGO, CALIF.
Capillary acquisition devices for high-performance vehicles: Executive summary [NASA-CR-159658] N80-19185

GENERAL DYNAMICS CORP. FORT WORTH, TEX.
Fastener hole quality, volume 1 [AD-A077859] N80-19567

GENERAL DYNAMICS CORP., SAN DIEGO, CALIF.
Magnetohydrodynamic (MHD) magnet modeling [AD-A078865] N80-19443

GENERAL ELECTRIC CO., CINCINNATI, OHIO.
Novel ceramic turbine rotor concepts [AD-A078669] N80-19118
Evaluation of fuel character effects on J79 engine combustion system [AD-A078440] N80-19119
Advanced infrared signature prediction program. Spectral calculation of radiation from a turbine propulsion system as intercepted by an observer (SCORPION). Volume 3: Analysis [AD-A078436] N80-19124

GENERAL ELECTRIC CO., SANTA BARBARA, CALIF.
Development of passive high pressure gauges: Field experiment [AD-A077194] N80-19474

GENERAL ELECTRIC CO., SCHENECTADY, N. Y.
Development of a low loss magnetic composite utilizing amorphous metal flakes [CONS-3205-T2] N80-19213
Low cost point focus solar concentrator. Phase 1: Preliminary design [JPL-9950-273] N80-19622
Screening evaluation of electric power cycles integrated with coal gasification plants [EPRI-AF-1160] N80-19646

GENERAL ELECTRIC CO., SYRACUSE, N.Y.
Tropospheric effects on HF Propagation N80-19380

GENERAL RESEARCH CORP., SANTA BARBARA, CALIF.
Verification and validation of avionic simulations N80-19814
Using assertions for adaptive testing of software [AD-A077388] N80-19875
GENOA UNIV. (ITALY).
Electric field components in presence of a sea-sea bottom interface at ELF N80-19367
Numerical modelling of structures to account for internal damping N80-19575
GEORGE WASHINGTON UNIV., WASHINGTON, D. C.
Final state correlation effects in auger lineshapes: Application to silicon dioxide [AD-A078037] N80-19221
Mechanistic studies of the effect of lead salts on double base propellant combustion. The use of model systems [AD-A075371] N80-19296
GEORGIA INST. OF TECH., ATLANTA.
Submillimeter wave spectroscopy and technology [AD-A078003] N80-19222
Electromagnetic shielding of structural foams by using internal conductive materials [AD-A078718] N80-19329
The NASA/MSFC global reference atmospheric model: MOD 3 (with spherical harmonic wind model) [NASA-CR-3256] N80-19704
GERMAN MILITARY GEOPHYSICAL OFFICE, TRABEN-TRARBACH (WEST GERMANY).
Biological and geophysical factors of electromagnetic wave propagation and their use in digital data banks N80-19363
GESELLSCHAFT FUER WIRTSCHAFTLICHE BAUTECHNIK M.B.H., MUNICH (WEST GERMANY).
Analytical software verification N80-19552
GOODYEAR AEROSPACE CORP., LITCHFIELD PARK, ARIZ.
The fabrication and testing of prototype UH-1 aircraft windshields manufactured with a sheet interlayer [AD-A077711] N80-19380
GOUGH (PAUL) ASSOCIATES, INC., PORTSMOUTH, N.H.
Two dimensional convective flamespreading in packed beds of granular propellant [AD-A075326] N80-19265
GRACE (W. R.) AND CO., MEMPHIS, TENN.
Synthesis gas demonstration plant program, phase 1 [FE-2577-06] N80-19308
GRUMMAN AEROSPACE CORP., BETHPAGE, N.Y.
Crew station design facility feasibility study [AD-A078134] N80-19384
Evaluation of dynamically riveted joints [AD-A077223] N80-19504
Project FIRES - Firefighters Integrated Response Equipment System. Volume 1: Program overview and summary, phase 1A [NASA-CR-161399] N80-19795
Project FIRES - Firefighters Integrated Response Equipment System. Volume 2: Protective ensemble performance standards goals for firefighter protection, phase 1A [NASA-CR-161400] N80-19796
Project FIRES - Firefighters Integrated Response Equipment System. Volume 3: Test and evaluation report, phase 1A [NASA-CR-161401] N80-19797
Project FIRES - Firefighters Integrated Response Equipment System. Volume 4: Technology demonstration ensemble, phase 1A [NASA-CR-161402] N80-19798
Project FIRES - Firefighters Integrated Response Equipment System. Volume 5: Prototype protective ensemble data package, phase 1A [NASA-CR-161403] N80-19799

H

HANFORD ENGINEERING DEVELOPMENT LAB., RICHLAND, WASH.
Performance measurement system: Recent systems development and applications [HEDL-SA-1826-FP] N80-19924
HARRIS CORP., MELBOURNE, FLA.
Development of the Maypole (Hoop/Column) deployable reflector concept for large space systems applications N80-19151
HARRY DIAMOND LABS., ADELPHI, MD.
Viscoelastic polymer for printed-circuit-board vibration damping [AD-A077903] N80-19275
A new approach to the design of highly efficient regulated dc-to-dc converters [AD-A078627] N80-19440
HARVARD SCHOOL OF PUBLIC HEALTH, BOSTON, MASS.
Setting priorities for control of fugitive particulate emissions from open sources [PB80-108962] N80-19674
HARVARD UNIV., CAMBRIDGE, MASS.
Nonequilibrium phenomena in superconducting phase-slip centers [AD-A078441] N80-19442
On optimization of query processing strategies [AD-A078470] N80-19666
HEWLETT-PACKARD CO., PALO ALTO, CALIF.
VPE growth of (Al, Ga)As [AD-A078264] N80-19667
HONEYWELL, INC., ST. PETERSBURG, FLA.
Military Adaptation of Commercial Item (MACI) program on Electrically Alterable Read Only Memory (EAROM) [AD-A078594] N80-19651
HUGHES AIRCRAFT CO., IRVINE, CALIF.
Forecast analysis of optical waveguide bus performance [NASA-CR-162851] N80-19942
HULL CORP., HATBORO, PA.
Program to design, develope, fabricate and deliver thin film chip inductors suitable for hybrid circuit applications [AD-A078840] N80-19432
HUMAN ENGINEERING LABS., ABERDEEN PROVING GROUND, MD.
A study of the canopy design for the advanced attack helicopter by use of computer graphics [AD-A078291] N80-19089
Effects of artillery noise on the hearing of protected crew personnel [AD-A078664] N80-19805
HYDROCARBON RESEARCH, INC., LAWRENCEVILLE, N. J.
Development of a fast fluid bed gasifier, task 2 and 3 [FE-2361-40] N80-19306

I

IBM FEDERAL SYSTEMS DIV., GAITHERSBURG, MD.
Interactive digital image processing investigation [AD-A078342] N80-19601
IBM FEDERAL SYSTEMS DIV., HUNTSVILLE, ALA.
Solar energy system performance evaluation: Seasonal report for SEMCO, Lowhatchee, Florida [NASA-CR-161379] N80-19627
Solar energy system performance evaluation: A seasonal report for SEMCO, Macon, Georgia [NASA-CR-161380] N80-19629
IDAHO NATIONAL ENGINEERING LAB., IDAHO FALLS.
The 6-beam test, for gamma densitometer [LTR-141-122] N80-19477
IDAHO UNIV., MOSCOW.
The use of multimedia and programmed teaching machines for remote sensing education N80-20012
ILLINOIS UNIV. AT URBANA-CHAMPAIGN.
In vivo and in vitro aging of plasma-sprayed alumina on 316L stainless steel and Ti6Al-4V ELI substrates N80-19231
Moisture movement and moisture equilibria in pavement systems [PB80-120082] N80-19314
Proceedings of the Antenna Applications Symposium [AD-A077167] N80-19334
An efficient rotational nonequilibrium model of a cw chemical laser [AD-A078485] N80-19487
Energy conservation in the U.S. economy from increased recycle of obsolete steel scrap N80-19492
An approximate finite-element method of stress analysis of non-axisymmetric bodies with elastic-plastic material behavior N80-19582
Model computations of radio wave scintillation caused by equatorial bubbles [AD-A077028] N80-19690
Photodesorption of gases from metal and semiconductor surfaces N80-19964
Crystal growth and phase stability of metastable indium antimonide biamide thin films N80-19965
ILLINOIS UNIV. AT URBANA-CHAMPAIGN, URBANA.
Methods of determining ionospheric structure from oblique sounding data N80-19384
ILLINOIS UNIV., CHICAGO.
An analysis of turbulent diffusion flame in axisymmetric jet [NASA-CR-162884] N80-19449
ILLINOIS UNIV., URBANA.
Lasing characteristics of gas mixtures involving UFG: Application to nuclear pumping of lasers [NASA-CR-162618] N80-19480
INCO RESEARCH AND DEVELOPMENT CENTER, SUFFERN, N. Y.
Alloy development of oxide dispersion strengthened high volume gamma nickel-base superalloys made by mechanical alloying [AD-A077615] N80-19252
INDIANA UNIV. AT BLOOMINGTON.
Evaluation of classical vaporization and ionization interferences in a miniature ICP [AD-A077886] N80-19225
Characteristics of the background emission spectrum from a miniature ICP [AD-A077876] N80-19955
INDUSTRIEANLAGEN-BETRIEBSGESELLSCHAFT M.B.H., OTTOBRUNN (WEST GERMANY).
Remarks on simulation. Objectives/areas of use/possibilites/limitations: An overview N80-19812
Simulation of overall air defense command and control N80-19816
Air-to-air engagement simulation N80-19834
Fire control for air-to-air gunnery in high performance fighter aircraft N80-19841
INSTITUT DE MECANIQUE DES FLUIDES DE LILLE (FRANCE).
Wind tunnel and free flight model identification experience N80-19103
INSTITUT DE RECHERCHE D'INFORMATIQUE ET D'AUTOMATISME, ROQUENCOURT (FRANCE).
Quantitative assessments of software reliability N80-19550
INSTITUT FUER ASTROPHYSIK UND EXTRATERRESTRISCHE FORSCHUNG, BONN (WEST GERMANY).
Coupling between the neutral and ionized upper atmosphere during disturbed conditions N80-19366
INSTITUTE FOR DEFENSE ANALYSES, ARLINGTON, VA.
Cost-effectiveness of flight simulators for military training N80-19830
Use of simulation in the evaluation of the IFFN process N80-19833
INSTITUTE FOR ENERGY ANALYSIS, OAK RIDGE, TENN.
Energy accounting for solar and alternative energy sources [ORAU/IEA(R)-79-11] N80-19647
INSTITUTE FOR TELECOMMUNICATION SCIENCES, BOULDER, COLO.
Theories of ground wave propagation over mixed paths N80-19350
Ground wave propagation over irregular, inhomogeneous terrain: Comparisons of calculations and measurements at frequencies from 121 kHz to 50 mHz N80-19352
Perspective on the prediction of auroral absorption N80-19390
Excitation of the HF surface wave by vertical and horizontal apertures N80-19410
Comparison of loop and dipole antennas in leaky feeder communication systems N80-19412
INSTITUTE OF AVIATION MEDICINE, FARNBOROUGH (ENGLAND).
Real-time simulation: An indispensable but overused evaluation technique N80-19820
INSTITUTE OF GAS TECHNOLOGY, CHICAGO, ILL.
Environmental assessment of the HYGAS process. Volume 1: HYGAS environmental characterization, data synthesis, analysis, and interpretation, tests 37 - 64 [FE-2433-25-VOL-1] N80-19305

INSTITUTO DE PESQUISAS ESPACIAIS, SAO JOSE DOS CAMPOS (BRAZIL).
Coastal water temperature in the southeastern portion of Brazil utilizing oceanographic data and NOAA sensor data, volume 2
[INPE-1989-RPE/070-VOL-2] N80-19745
INSTITUTO NACIONAL DE METEOROLOGIA E GEOFISICA, LISBON (PORTUGAL).
Ionospheric effects of a solar eclipse in the Cape Verde Islands N80-19399
INTER-UNION COMMISSION ON GEODYNAMICS, VANCOUVER (BRITISH COLUMBIA).
Geodynamics international - 15
[PB80-111090] N80-19698
INTERACTIVE TELEVISION CO., ARLINGTON, VA.
Aviation training using video disk technology N80-19839
INTERMETRICS, INC., HUNTSVILLE, ALA.
NSSC-2 operating system design requirements specification
[NASA-CR-161396] N80-19661
IONOSPHAREN-INSTITUT BREISACH (WEST GERMANY).
Basic findings helpful for ionospheric predictions N80-19387
IOWA UNIV., IOWA CITY.
The effect of test system misalignment in the dynamic tension test
[NASA-CR-162829] N80-19564
ISTITUTO DI TECNOLOGIA AEROSPAZIALE, ROME (ITALY).
Damping effects in joints and experimental tests on riveted specimens N80-19584

J

JAMES COOK UNIV. OF NORTH QUEENSLAND, TOWNSVILLE (AUSTRALIA).
Transequatorial propagation through equatorial plasma bubbles: Discrete events N80-19393
A mobile HF impulse source locator N80-19414
JAY - CARTER ENTERPRISES, INC., BURKBURNETT, TEX.
A 15 kWe (nominal) solar thermal-electric power conversion concept definition study: Steam Rankin reciprocator system
[NASA-CR-159561] N80-19612
JET PROPULSION LAB., CALIFORNIA INST. OF TECH., PASADENA.
JPL self pulsed laser surface measurement system development N80-19149
Large space system control technology overview N80-19162
Large space system control technology status and accomplishments N80-19163
JPL analytical performance prediction capability N80-19167
Flexible materials technology N80-19171
Attitude control study for a large flexible spacecraft using a Solar Electric Propulsion System (SEPS)
[NASA-CR-162578] N80-19183
The geometry of the 37-tile microwave antenna support structure
[NASA-CR-162947] N80-19321
Optical-communication systems for deep-space applications
[NASA-CR-162862] N80-19323
On the characteristics of centrifugal-reciprocating machines
[NASA-CR-162881] N80-19499
Spacecraft damping considerations in structural design N80-19578
LSA field test
[NASA-CR-162798] N80-19611
Develop silicone encapsulation systems for terrestrial silicon solar arrays
[NASA-CR-162840] N80-19617
Automated array assembly task in-depth study of silicon wafer surface texturizing
[NASA-CR-162883] N80-19618
Development of economical improved thick film solar cell contact
[NASA-CR-162849] N80-19619
A new method of metallization for silicon solar cells
[NASA-CR-162823] N80-19620
High temperature solar thermal receiver
[NASA-CR-162831] N80-19621
Low cost point focus solar concentrator. Phase 1: Preliminary design
[JPL-9950-273] N80-19622
Slicing of silicon into sheet material. Silicon sheet growth development for the large area silicon sheet task of the low cost solar array project
[NASA-CR-162828] N80-19623
Low cost point focus solar concentrator, phase 1
[NASA-CR-162848] N80-19624
Low-costs point-focus solar concentrator, phase 1
[NASA-CR-162839] N80-19625
Annual technical report, fiscal year 1979. Volume 1: Executive summary
[NASA-CR-159715] N80-19632
Glass for low-cost photovoltaic solar arrays
[NASA-CR-162895] N80-19633
The effects of regional insolation differences upon advanced solar thermal electric power plant performance and energy costs
[NASA-CR-162896] N80-19634
Forecast analysis of optical waveguide bus performance
[NASA-CR-162851] N80-19642
The levels of edit, second edition
[NASA-CR-162880] N80-19983
Effects of tunnel and station size on the costs and service of subway transit systems
[UMTA-CA-06-0116-79-2] N80-19989
Low-cost bus-tunnels to the central business district
[UMTA-CA-06-0116-79-1] N80-19990
Application of digital image processing techniques to astronomical imagery, 1979
[NASA-CR-162877] N80-19996
JOINT PUBLICATIONS RESEARCH SERVICE, ARLINGTON, VA.
USSR report: Space biology and aerospace medicine, v. 14, no.1
[JPRS-75251] N80-19755
Scheduling work and rest periods during long-term space flights N80-19756
Effects of flights differing in duration on protein composition of cosmonauts blood N80-19757
Effects of unusual schedules of daily activity and sleep deprivation on man's functional state and work fitness N80-19758
Effects of long-term space flights on reactions of adrenal cortex and medulla N80-19759
Cardiovascular reaction to periodic head-pelvis accelerations on a short-arm centrifuge N80-19760
Reaction of human blood to chronic exposure to low doses of carbon monoxide in a confined environment N80-19761
Probability of altitude decompression disorders when breathing oxygen containing human waste gases N80-19762
Effect of hyperoxia on oxygen transport properties of blood N80-19763
External respiration and acid-base balance of human blood during long-term antiorthostatic hypokinesia and in the recovery period N80-19764
Distinctions in development of pyrogenal fever in animals following prolonged hypokinesia N80-19765
Rapid laboratory method for testing outgassing of thermostable plastics and rubber N80-19766
Effects of 25 and 50 MeV protons on human peripheral blood lymphocyte chromosones in vitro N80-19767
Development of program for the control of the autotrophic component of an ecological system that is closed with regard to exchange of gases N80-19768
Effect of sodium bicarbonate on reactivity and trophics of vestibular analyzer N80-19769
Evaluation and forecasting of mental fitness of flight personnel in the presence of neurosis N80-19770
Dynamics of stress reaction of rats during experimental hypokinesia varying in duration, and possibility of correction thereof N80-19771
Effect of brief antiorthostatic hypokinesia on blood immunoglobulin content N80-19772
Rat plasma and tissue lipids after a long-term space flight N80-19773
Functional changes in the adrenal cortex during simulation of stress situations in the presence of high carbon monoxide levels N80-19774
Effect of hypoxia and hypercapnia on lactate and pyruvate levels in rat blood and myocardium N80-19775
Study of radioprotective effect of high-intensity magnetic fields on mammalian cell cultures N80-19776
Studies of the effects of stationary magnetic fields on rat erythron N80-19777
JOINT RADIO COMMITTEE OF THE NATIONALISED POWER INDUSTRIES, LONDON (ENGLAND).
Radio network and radio link surveys derived by computer from a terrain data base N80-19365

K

KAY AND ASSOCIATES, INC., MOUNT PROSPECT, ILL.
Avionics logistics support including V/STOL, LAMPS, and instrument repair
[AD-A077460] N80-19087
KENTUCKY UNIV., LEXINGTON.
A stochastic realization approach to the smoothing problem. Revised
[AD-A078137] N80-19917
KMS FUSION, INC., ANN ARBOR, MICH.
Glass shell manufacturing in space
[NASA-CR-161408] N80-19141

L

LAND-AIR, INC., BETHESDA, MD.
Engineering evaluation of control technology for H-Coal and Exxon donor solvent processes
[PB80-108566] N80-19679
LE MATERIEL TELEPHONIQUE, TRAPPES (FRANCE).
Using a language developed for aircraft simulators N80-19831
LEHIGH UNIV., BETHLEHEM, PA.
Centrifugal fluidized combustion of coal
[FE-2516-9] N80-19293
Methanol and methyl fuel catalysts
[FE-2177-4] N80-19302
LEICESTER UNIV. (ENGLAND).
HF wavefront irregularities observed on a large aperture receiving array N80-19396
LIEGE UNIV. (BELGIUM).
Effective use of natural modes in VHF and UHF tunnel propagation N80-19411
LIFE SYSTEMS, INC., CLEVELAND, OHIO.
Development of a nitrogen generation system
[NASA-CR-152333] N80-19800
LILLE UNIV. (FRANCE).
Experimental results on the free propagation of UHF waves in tunnels N80-19409
Sea surface temperature of the coastal zones of France. Heat Capacity Mapping Mission (HCMM)
[E80-10057] N80-19585
LINCOLN LAB., MASS. INST. OF TECH., LEXINGTON.
Photometry of artificial satellites application to the Ground Electro-Optical Deep Space Surveillance (GEODSS) program
[AD-A078675] N80-19176
Geometry, artificial satellites, and orbit determination
[AD-A077049] N80-19177
Experimental measurements of ground reflection elevation multipath characteristics and its effects on a small aperture elevation tracking radar
[AD-A077915] N80-19327
Prediction of radar coverage against very low altitude aircraft N80-19364
On influencing the operating temperatures of Motorola and Arco solar photovoltaic modules
[COO-4094-59] N80-19649
Magnetic moment versus temperature curves of rare-earth iron garnets
[AD-A077356] N80-19970
Advanced electronic technology
[AD-A077589] N80-20021
LITTLE (ARTHUR D.), INC., BOSTON, MASS.
Assessment of risk due to the use of carbon fiber composites in commercial and general aviation N80-19201
LOCKHEED ENGINEERING AND MANAGEMENT SERVICES CO., INC., HOUSTON, TEX.
As-built design specifications of the LANDSAT Imagery Verification and Extraction System (LIVES). Volume 1: Text and appendices
[E80-10077] N80-19586

Quantitative estimation of plant characteristics using spectral measurement: A survey of the literature [E80-10078] N80-19587

LOCKHEED-GEORGIA CO., MARIETTA.
Aerodynamic investigation of C-141 leading edge modification for cruise drag reduction, volume 2 [AD-A077986] N80-19081

LOCKHEED MISSILES AND SPACE CO., PALO ALTO, CALIF.
Ionospheric-Magnetospheric Plasma Experiment (IMPE) [AD-A078992] N80-19687
GLOBALMIN: A computer program for global optimization [AD-A078989] N80-19870
Design and implementation of a new descent algorithm for local optimization [AD-A078229] N80-19896

LOCKHEED MISSILES AND SPACE CO., SUNNYVALE, CALIF.
Offset wasp rib concept and development N80-19146
Construction alignment sensor feasibility demonstrations (laser measurement) N80-19148
Surface measuring technique N80-19155

LOS ALAMOS SCIENTIFIC LAB., N. MEX.
Thermochemical processes for hydrogen production [LA-7937-PR] N80-19299
Steady-wave analysis of the effect of porosity on viscous and inviscid detonations by use of a reactive-porous analog [LA-7819] N80-19483
Characterization and assessment of selected solar thermal energy systems for residential and process heat applications [LA-7995-TASE] N80-19648
Computer applications [LA-7944-PR] N80-19854
Nuclear waste management technology development activities [LA-7921-PR] N80-19937
Normal ionizing shock as a theta pinch preionizer [LA-8084-MS] N80-19960

LOWELL UNIV., MASS.
Digital on-line processing and display of multiparameter HF transmission data N80-19416

M

MAGNETIC CORP. OF AMERICA, WALTHAM, MASS.
Magnetohydrodynamic (MHD) magnet modeling [AD-A078865] N80-19443

MARCONI-ELLIOTT AVIONIC SYSTEMS LTD., ROCHESTER (ENGLAND).
The A-7 head-up display reliability programme N80-19539

MARCONI RADAR SYSTEMS LTD., CHELMSFORD (ENGLAND).
Software reliability: Understanding and improving it N80-19548

MARCONI SPACE AND DEFENCE SYSTEMS LTD., HILLEND (SCOTLAND).
A mission training simulator for the Nimrod MR MK 2 and some aspects of the derivation and verification of its system models N80-19826

MARYLAND UNIV., COLLEGE PARK.
The structure of specifications and implementations of data abstraction [AD-A077427] N80-19850
Log diameter restricted bottom-up triangle cellular acceptors UTCA's [AD-A077526] N80-19872
Cellular D-graph automata with augmented memory [AD-A077389] N80-19877
Local reconfiguration of networks of processors: Arrays, trees, and graphs [AD-A077525] N80-19886
Region representation: Quadtrees from boundary codes [AD-A078350] N80-19892
Linear time calculations of geometric properties using quadtrees [AD-A078087] N80-19897
Finite element method for the triconi problem [ORO-3443-84] N80-19911

MASSACHUSETTS INST. OF TECH., CAMBRIDGE.
Wall pressure fluctuations during transition on a flat plate [AD-A075376] N80-19035
Design of a program for expert diagnosis of acid base and electrolyte disturbances [AD-A078413] N80-19226
Comparison of crystallinity and molecular orientation between surface and bulk of some polymers by FTIR-ATR and transmission spectroscopy [AD-A078243] N80-19269
Surface chemical composition - depth profile of polyether polyurethaneureas as studied by FT-IR and ESCA [AD-A078240] N80-19272
Theoretical modelling and experimental data matching for active and passive microwave remote sensing of Earth terrain N80-19360
An application of the photometric stereo method [AD-A078125] N80-19470
Landsat MSS coordinate transformations [AD-A078418] N80-19596
Wave power extraction by floating bodies [AD-A078058] N80-19637
Learning by understanding analogies [AD-A078123] N80-19793
Toward a remotely-manned energy and production economy [AD-A078069] N80-19804
Dependency directed reasoning for complex program understanding [AD-A078055] N80-19864
Computer aided evolutionary design for digital integrated systems [AD-A078124] N80-19865
Computer aided evolutionary design for software engineering [AD-A078060] N80-19866
AMORD: A deductive procedure system [AD-A078417] N80-19891
Combining and updating of local estimates and regional maps along sets of one-dimensional tracks [AD-A080034] N80-19902
Differential geometry, surface patches and convergence methods [AD-A078081] N80-19927
Theory of edge detection [AD-A078063] N80-19941
Some properties of discontinuities in the image irradiance equation [AD-A078062] N80-19948
Serializability of concurrent database updates [AD-A078414] N80-19984

MATERIALS RESEARCH LABS., ASCOT VALE (AUSTRALIA).
Errors in the measurement of angle with a laser interferometer [AD-A078048] N80-19481

MATHEMATICAL APPLICATIONS GROUP, INC., ELMSFORD, N. Y.
The RADOT code system to calculate the radar return from a forested area [AD-A078471] N80-19333

MAX-PLANCK-INSTITUT FUER AERONOMIE, KATLENBURG-LINDAU (WEST GERMANY).
The phenomenology of transequatorial radio propagation under spread-F conditions N80-19394
Detection, ranging and driftspeed measurements of equatorial ionospheric irregularities by means of airglow observations N80-19395

MCDONNELL-DOUGLAS ASTRONAUTICS CO., HUNTINGTON BEACH, CALIF.
Development of a composite geodetic structure for space construction, phase 1A [NASA-CR-160558] N80-19144
Metrics of software quality [AD-A077896] N80-19889

MCDONNELL-DOUGLAS ASTRONAUTICS CO., ST. LOUIS, MO.
Injection laser waveguide coupler [AD-A077030] N80-19484

MEAD TECHNOLOGY LABS., DAYTON, OHIO.
Color ink-jet demonstration program [AD-A075377] N80-19476

MESSERSCHMITT-BOELKOW-BLOHM G.M.B.H., MUNICH (WEST GERMANY).
Production Reliability Assurance (PRA): Testing N80-19531
Reliability investigations on an automatic test system N80-19544
MEX: A new procedure for development of maintenances policies N80-19558

MESSERSCHMIDT-BOELKOW G.M.B.H., MUNICH (WEST GERMANY).
Dynamic environments and test simulation for qualification of aircraft equipment and external stores N80-19592

MICHIGAN STATE UNIV., EAST LANSING.
Use of remote sensing for land use policy formulation [E80-10085] N80-19592

MICHIGAN UNIV., ANN ARBOR.
Trajectories optimization in hypersonic flight [NASA-CR-162948] N80-19028
Sintering of beta silicon nitride solid solutions containing metal oxide [AD-A077415] N80-19209

MIDDLE EAST TECHNICAL UNIV., ANKARA (TURKEY).
The effects of stratified ground on characteristics of the inverted L antenna N80-19348

MIDWEST RESEARCH INST., GOLDEN, COLO.
General reliability and safety methodology and its application to wind energy conversion systems [SERI/TR-35-234] N80-19645

MINISTRY OF DEFENCE, LONDON (ENGLAND).
The integrated management of reliability and maintainability in procurement N80-19558
Computer simulation model of the logistic support system for electrical engineering test equipment N80-19580

MISSION RESEARCH CORP., SANTA BARBARA, CALIF.
Augmentation of HF propagation N80-19379

MISSOURI UNIV. -ROLLA.
Azimuth beamwidth effect on radar sensed terrain horizon profiles N80-19362

MITRE CORP., BEDFORD, MASS.
Computerized models for design and analysis of computer communications systems [AD-A078022] N80-19324
Surface fields and radiation patterns of a vertical electric dipole over a radially varying ground system N80-19348
The application of modeling and simulation to the development of the E-3A N80-19823
Application of computer simulations to development of NATO E-3A automatic track initiation algorithms N80-19827
The Mitre Interactive Communications Analysis Program (MICAP) N80-19835

MORGAN SEMICONDUCTOR, INC., GARLAND, TEX.
GE-SI supersonic FLIR window [AD-A078371] N80-19948

N

NAGOYA UNIV. (JAPAN).
Confinement and heating of hot plasmas in a hybrid system of Tokamak and stellarator [ISSN-0547-1567] N80-19953

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, WASHINGTON, D. C.
Aeronautical engineering: A continuing bibliography with indexes (supplement 119) [NASA-SP-7037(119)] N80-19021
Application of a numerically generated orthogonal coordinate system to the solution of inviscid axisymmetric supersonic flow over blunt bodies [NASA-TP-1619] N80-19031
Structural analysis of hollow blades: Torsional stress analysis of hollow fan blades for aircraft jet engines [NASA-TM-75718] N80-19111
Methods of sound simulation and applications in flight simulators [NASA-TM-75788] N80-19133
Determination of the technical constants of laminates in oblique directions [NASA-TM-75719] N80-19207
Simulation program of nonlinearities applied to telecommunication systems [NASA-TM-75511] N80-19320
A laser profilometer for digital terrain mapping N80-19369
Atomization of a liquid by a spray nozzle [NASA-TM-75771] N80-19447
Memory effects in turbulence [NASA-TM-75516] N80-19451

Convective flows of viscous fluid in spherical layers. Certain astrophysical applications
[NASA-TM-75923] N80-19452
Outline of research on oscillating boundary layers
[NASA-TM-75806] N80-19453
Theory of twisted nonuniformly heated bars
[NASA-TM-75758] N80-19565
Calculation of the relationship between attenuation and intensity of precipitation for various polarizations
[NASA-TM-75779] N80-19705
Effect of habituation on the susceptibility of the rat to restraint ulcers
[NASA-TM-76072] N80-19748
NASA standard procedures for the microbiological examination of space hardware
[NASA-TM-80756] N80-19749
Effect of graded physical load on the state of the liver from morphometric data and biochemical blood indices of rats against a background of hypokinesis
[NASA-TM-75969] N80-19750
Effectiveness of using thyrocalcitonin for the prevention of a calcium metabolic disorder in the mineralized tissues of rabbits with 30 days hypokinesia
[NASA-TM-75967] N80-19751
Dynamics of erythrocyte count, hemoglobin, and catalase activity in rat blood in hypokinesia, muscular activity and restoration
[NASA-TM-76058] N80-19752
State of the mineral component of rat bone tissue during hypokinesia and the recovery period
[NASA-TM-76059] N80-19753
Reaction of chickens to graduated length of exposure to stress
[NASA-TM-76071] N80-19754
Aerospace medicine and biology: A continuing bibliography with indexes, supplement 203
[NASA-SP-7011(203)] N80-19779
Aerospace medicine and biology: A continuing bibliography with indexes, supplement 204
[NASA-SP-7011(204)] N80-19781
Effect of hypokinesia on cardiac contractile function and nervous regulation of the heart
[NASA-TM-75970] N80-19783
Alimentary hypokinesia
[NASA-TM-75969] N80-19784
Metabolism during hypodynamia
[NASA-TM-75896] N80-19785
Blood circulation under conditions of weightlessness
[NASA-TM-76036] N80-19786
Certain questions of the acclimatization of construction workers to the conditions of a subtropical climate
[NASA-TM-75728] N80-19787
A device for determining the intensity of partial sweating
[NASA-TM-75429] N80-19801
X-ray optical properties of a Wolter telescope
[NASA-TM-75811] N80-19994
On the continuing stellar formation in the central regions of some globular clusters and their relation to the pulsars
[NASA-TM-75703] N80-19998
NASA programs in technology transfer and their relation to remote sensing education N80-20009

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. AMES RESEARCH CENTER, MOFFETT FIELD, CALIF.

Analysis of fuel-conservative curved decelerating approach trajectories for powered-lift and CTOL jet aircraft
[NASA-TP-1650] N80-19022
Workshop on Aircraft Surface Representation for Aerodynamic Computation
[NASA-TM-81170] N80-19025
Application of the concept of dynamic trim control to automatic landing of carrier aircraft
[NASA-TP-1512] N80-19126
Flight evaluation of configuration management system concepts during transition to the landing approach for a powered-lift STOL aircraft
[NASA-TM-81146] N80-19127
Texture extraction on the ILLIAC 4
[AD-A070523] N80-19471
Effect of field of view and monocular viewing on angular size judgements in an outdoor scene
[NASA-TM-81176] N80-19792
Conference of Remote Sensing Educators (CORSE-78)
[NASA-CP-2102] N80-20003
NASA's western regional applications training activity N80-20010
Data reduction by computer processing N80-20016
The reduction of remote sensing data by visual means N80-20017

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. HUGH L. DRYDEN FLIGHT RESEARCH CENTER, EDWARDS, CALIF.

Aircraft identification experience N80-19100
Thermocouple, multiple junction reference oven
[NASA-CASE-FRC-10112-1] N80-19489

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. GODDARD SPACE FLIGHT CENTER, GREENBELT, MD.

A high resolution soil moisture radiometer N80-19181
Interactive analysis program activity N80-19186
Theoretical modeling and experimental data matching for active and passive microwave remote sensing of Earth terrain N80-19380
A linear magnetic motor/generator
[NASA-CASE-GSC-12518-1] N80-19424
LANDSAT digital analysis of the initial recovery of the Kokolik River tundra fire area, Alaska
[E80-10080] N80-19588
SMMR simulator radiative transfer calibration model. 1: Derivation
[E80-10081] N80-19589
A critical comparison of remote sensing and other methods for nondestructive estimation of standing crop biomass
[E80-10052] N80-19590
Multisensor analysis of hydrologic features in the Wind River Range, Wyoming with emphasis on the SEASAT SAR
[E80-10053] N80-19591
The space science data service: A study of its efficiencies and costs
[NASA-TM-80760] N80-19992
Interplanetary medium data book, supplement, 1975 - 1978
[NASA-TM-80759] N80-19997

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LYNDON B. JOHNSON SPACE CENTER, HOUSTON, TEX.

Space fabrication: Graphite composite truss welding and cap forming subsystems N80-19158
Orbit attitude processor. STS-1 bench program verification test plan
[JSC-16388] N80-19178
Field resonance propulsion concept
[NASA-TM-80961] N80-19184
Method of forming dynamic membrane on stainless steel support
[NASA-CASE-MSC-18172-1] N80-19237
High temperature penetrator assembly with bayonet plug and ramp-activated lock
[NASA-CASE-MSC-18526-1] N80-19488
Life sciences flight experiments program, life sciences project division, procurement quality provisions
[NASA-TM-80962] N80-19515
Orbiter fuel cell performance constraints. STS/OPS Pratt Whitney fuel cells. Operating limits for mission planning
[NASA-TM-80958] N80-19610

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LANGLEY RESEARCH CENTER, LANGLEY STATION, VA.

Aeroacoustic wind-tunnel tests of a light twin-boom general-aviation airplane with free or shrouded-pusher propellers
[NASA-TM-80203] N80-19023
Military aircraft and missile technology at the Langley Research Center: A selected bibliography
[NASA-TM-80204] N80-19024
A flight investigation of blade section aerodynamics for a helicopter main rotor having NLR-1T airfoil sections
[NASA-TM-80186] N80-19033
Identification evaluation methods N80-19096
A theoretical analysis of simulated transonic boundary layers in cryogenic-nitrogen wind tunnels
[NASA-TP-1631] N80-19131
Design considerations for attaining 250-knot test velocities at the aircraft landing dynamics facility
[NASA-TM-80222] N80-19132
Development of the cryogenic tunnel concept and application to the US National Transonic Facility N80-19139
Orbit dynamics and geographical coverage capabilities of satellite-based solar occultation experiments for global monitoring of stratospheric constituents
[NASA-TP-1808] N80-19142
Large Space Systems Technology, 1979
[NASA-CP-2119] N80-19145
FY-79 - LSST antenna technology development N80-19150
Development of electromagnetic analysis methods for large aperture antennas N80-19153
Electrostatic forming N80-19154
Structural concepts for large spacecraft N80-19156
LaRC controls activity for LSST N80-19165
FY-79 - development of fiber optics connector technology for large space systems N80-19170
Advanced materials for space N80-19172
Assessment of Carbon Fiber Electrical Effects
[NASA-CP-2119] N80-19193
Approach to the assessment of the hazard N80-19194
Release of carbon fibers from burning composites N80-19195
Dissemination, resuspension, and filtration of carbon fibers N80-19196
Large-scale fiber release and equipment exposure experiments N80-19198
Perspective on the results N80-19202
Trends in reliability modeling technology for fault tolerant systems N80-19534
Emulation applied to reliability analysis of reconfigurable, highly reliable, fault-tolerant computing systems N80-19541
Hydroelastic vibration analysis of partially liquid-filled shells using a series representation of the liquid
[NASA-TP-1558] N80-19563
Automated syringe sampler
[NASA-CASE-LAR-12309-1] N80-19984

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LEWIS RESEARCH CENTER, CLEVELAND, OHIO.

Preliminary study of VTO thrust requirements for a V/STOL aircraft with lift plus lift/cruise propulsion
[NASA-TM-81429] N80-19110
Comparison of the tribological properties at 25 C of seven different polyimide films bonded to 301 stainless steel
[NASA-TM-81413] N80-19263
Coupled cavity traveling wave tube with velocity tapering
[NASA-CASE-LEW-12298-1] N80-19425
Damping in tapered annular seals for an incompressible fluid
[NASA-TP-1646] N80-19495
Calculated and experimental data for a 118-mm bore roller bearing to 3 million DN
[NASA-TM-81427] N80-19496
Ferrographic and spectrographic analysis of oil sampled before and after failure of a jet engine
[NASA-TM-81430] N80-19497
Ideal spiral bevel gears: A new approach to surface geometry
[NASA-TM-81446] N80-19498
Teetered, tip-controlled rotor: Preliminary test results from Mod-0 100-kW experimental wind turbine
[NASA-TM-81445] N80-19613
Installation and checkout of the DOE/NASA Mod-1 2000-kW wind turbine generator
[NASA-TM-81444] N80-19614
Cogeneration Technology Alternatives Study (CTAS). Volume 1: Summary
[NASA-TM-81400] N80-19626
Algorithm for calculating turbine cooling flow and the resulting decrease in turbine efficiency
[NASA-TM-81453] N80-19663

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. MARSHALL SPACE FLIGHT CENTER, HUNTSVILLE, ALA.

Structural assembly in space N80-19159
Space processing applications rocket project SPAR 4, engineering report
[NASA-TM-78235] N80-19173

Isoelectric focusing of red blood cells in a density gradient stabilized column
[NASA-TM-76259] N80-19217
Evaluation of SRM flex bearing materials and processes
[NASA-TM-76256] N80-19264
Installation guidelines for solar heating system, single-family residence at New Castle, Pennsylvania
[NASA-CR-161365] N80-19630
NATIONAL AEROSPACE LAB., AMSTERDAM (NETHERLANDS).
Aspects of flight test instrumentation N80-19096
Analysis of aircraft performance stability and control measures N80-19099
The cryogenic wind tunnel: another option for the European Transonic Facility N80-19140
Mathematical formulation of damping for structural response analysis N80-19573
A flight simulation investigation on the feasibility of curved approaches under MLS guidance N80-19644
NATIONAL BUREAU OF STANDARDS, WASHINGTON, D.C.
Effects of carbon fibers on consumer products N80-19204
Passive films, surface structure and stress corrosion and crevice corrosion susceptibility
[AD-A078596] N80-19343
A standard for RF modulation factor
[PB80-109885] N80-19319
Low velocity performance of a high speed vane anemometer
[AD-A077457] N80-19475
Journal of Research of the National Bureau of Standards, volume 84, no. 5
[PB80-103674] N80-20022
NATIONAL ENVIRONMENTAL SATELLITE SERVICE, WASHINGTON, D. C.
NOAA satellite monitoring of snow cover in the Northern Hemisphere during the winter of 1977 N80-19594
NATIONAL LIBRARY OF MEDICINE, BETHESDA, MD.
NLM online services reference manual
[PB80-114831] N80-19667
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, BOULDER, COLO.
Toward global monitoring of the ionosphere in real time by a bottomside network: The geophysical requirements and the technological opportunity N80-19381
Ocean swell parameters from narrow-beam HF radar sea echo N80-19404
Geodynamics International - 15
[PB80-111089] N80-19696
NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA.
Remotely piloted vehicles, volume 2. A bibliography with abstracts
[PB80-802119] N80-19089
Biotelemetry, volume 2. Citations from the Engineering Index data base
[PB80-802101] N80-19181
Biotelemetry. Citations from the NTIS data base
[PB80-802093] N80-19182
Stress corrosion of stainless steels, volume 2. Citations from the Engineering Index data base
[PB80-803208] N80-19257
Stress corrosion of stainless steels, volume 2. Citations from the NTIS data base
[PB80-802190] N80-19258
Powder metallurgy of aluminum. Citations from the NTIS data base
[PB80-803216] N80-19259
Powder metallurgy of aluminum. Citations from the Engineering Index data base
[PB80-803224] N80-19260
Carbon monoxide lasers. Citations from the NTIS data base
[PB80-803133] N80-19490
Carbon monoxide lasers, volume 2. Citations from the Engineering Index data base
[PB80-803141] N80-19491
Thrust, sleeve and jewel bearings, volume 2. Citations from the Engineering Index data base
[PB80-802630] N80-19511
Thrust, sleeve and jewel bearings. Citations from the NTIS data base
[PB80-802622] N80-19512
Cadmium sulfide solar cells, volume 1. Citations from the NTIS data base
[PB80-802218] N80-19656
Solar electric power generation, volume 3. Citations from the Engineering Index data base
[PB80-803034] N80-19657
Solar electric power generation, volume 2. Citations from the NTIS data base
[PB80-803000] N80-19658
Solar electric power generation, volume 3. Citations from the NTIS data base
[PB80-803018] N80-19659
Solar electric power generation, volume 2. Citations from the Engineering Index data base
[PB80-803026] N80-19660
Solar sea power plants. Citations from the NTIS data base
[PB80-802580] N80-19661
Solar seapower plants. Citations from the Engineering Index data base
[PB80-802598] N80-19662
Weather modification effects and management. A bibliography with abstracts
[PB80-802796] N80-19744
Biofeedback. A bibliography with abstracts
[PB80-803117] N80-19790
Stress factors on pilot performance. A bibliography with abstracts
[PB80-803075] N80-19794
Human work measurement. A bibliography with abstracts
[PB80-803166] N80-19807
Random access memories. Citations from the NTIS data base
[PB80-802333] N80-19858
Random access memories, volume 1. Citations from the Engineering Index data base
[PB80-802341] N80-19859
Random access memories, volume 2. Citations from the Engineering Index data base
[PB80-802358] N80-19860
Natural language processing, volume 1. Citations from the NTIS data base
[PB80-803281] N80-19883
Natural language processing, volume 2. Citations from the NTIS data base
[PB80-803299] N80-19884
Natural language processing. Citations from the Engineering Index data base
[PB80-803307] N80-19885
Integration of nonlinear differential equations. A bibliography with abstracts
[PB80-802978] N80-19912
Josephson junctions. Citations from the NTIS data base
[PB80-802895] N80-19975
Josephson junctions, volume 2. Citations from the Engineering Index data base
[PB80-802903] N80-19976
NATO PROGRAMMING CENTRE, TONGEREN (BELGIUM).
Simulation within military defence systems for training and evaluation N80-19819
NAVAL ACADEMY, ANNAPOLIS, MD.
Microprocessor control of low speed V/STOL flight
[AD-A077661] N80-19129
NAVAL AEROSPACE MEDICAL RESEARCH LAB., PENSACOLA, FLA.
Comparison of specifications for Head-Up Displays in the Navy A-4M, A-7E, AV-8A, and F-14A aircraft
[AD-A080047] N80-19106
The Thousand Aviator study: 1969 - 1971 follow-up program with distributions and intercorrelations of selected variables
[AD-A079700] N80-19789
NAVAL AIR DEVELOPMENT CENTER, WARMINSTER, PA.
Proceedings of a Workshop on V/STOL Aircraft Aerodynamics, volume 1
[AD-A079115] N80-19074
E-3A navigational computer system real-time environmental simulator N80-19824
Modeling the human operator: Applications to system cost effectiveness N80-19846
Predicting field of view requirements for VSTOL aircraft approach and landing N80-19847
NAVAL AIR PROPULSION TEST CENTER, TRENTON, N.J.
Effect of engine operating environments on lubricant load carrying capacity of high gear load oils
[AD-A078421] N80-19278
NAVAL AIR SYSTEMS COMMAND, WASHINGTON, D. C.
Guide to standard weather summaries and climatic services
[AD-A078660] N80-19708
NAVAL CIVIL ENGINEERING LAB., PORT HUENEME, CALIF.
Solar-powered sun tracker
[AD-A078653] N80-19640
NAVAL COASTAL SYSTEMS CENTER, PANAMA CITY, FLA.
Data analysis for Ocean Thermal Energy Conversion (OTEC)
[AD-A077908] N80-19638
NAVAL ENVIRONMENTAL PREDICTION RESEARCH FACILITY, MONTEREY, CALIF.
Winter shamal in the Persian Gulf
[AD-A077727] N80-19720
NAVAL OCEAN SYSTEMS CENTER, SAN DIEGO, CALIF.
Scintillation of UHF Satcom signals, ocurrence at Guam from mid-March 1978 - June 1979
[AD-A078257] N80-19329
A computer program for ELF/VLF pulse propagation in a laterally homogeneous Earth-ionosphere waveguide
[AD-A078306] N80-19341
Strategic blue-green optical communications program plan. Investment strategy toward an optical solution for satellite-to-submarine information transfer
[AD-A078345] N80-19344
Power series for the calculation of Bessel functions for large arguments, provides J sub nu (x) and y sub nu (x), accurate to at least 14 places
[AD-A077899] N80-19698
NAVAL POSTGRADUATE SCHOOL, MONTEREY, CALIF.
Transverse oscillations of smooth and rough cylinders in harmonic flow
[AD-A078271] N80-19034
Proceedings of a Workshop on V/STOL Aircraft Aerodynamics, volume 2
[AD-A078909] N80-19042
Application of Loran-C positioning to hydrographic surveying
[AD-A078278] N80-19057
Accuracy and repeatability indices for joint oil analysis program data
[AD-A078156] N80-19266
Acoustooptic spectrum analysis and narrowband interference excision in wideband signal environments
[AD-A078286] N80-19325
Waste heat recovery unit design for gas turbine propulsion systems
[AD-A078154] N80-19503
An analysis of the evolution of the reliability and maintainability disciplines N80-19520
Reliability growth models N80-19522
Application of the lognormal distribution to corrective maintenance downtimes N80-19545
Dynamic structural model of a submerged ring
[AD-A078157] N80-19568
Representation of hydrographic surveys and ocean bottom topography by analytical models
[AD-A078282] N80-19746
The evaluation of dull beam echo sounders in hydrographic surveying
[AD-A078273] N80-19747
Security kernel design for a micro-processor-based, multilevel archival storage system
[AD-A078281] N80-19848
Prediction intervals for first order Markov processes
[AD-A078283] N80-19918
Group decision making with feedback
[AD-A078159] N80-19980
Competition in the acquisition of major weapons systems
[AD-A078268] N80-19981
NAVAL RESEARCH LAB., WASHINGTON, D. C.
Failure causing defects in ceramics: What NDE should find
[AD-A078234] N80-19267

Machining flaws and the strength grain size behavior of ceramics
[AD-A075936] N80-19277
The effect of seawater on polymers
[AD-A077324] N80-19281
A unique radio oceanographic radar
[AD-A077364] N80-19332
The geomorphology of the HF breakthrough phenomenon N80-19365
Gas channel formation: Dependence of hydrodynamic phenomena on the initial radial pressure profile
[AD-A078917] N80-19459
The theory of free electron lasers
[AD-A075363] N80-19482
Software engineering principles
[AD-A078005] N80-19568
Performance collapse due to overhead in a simple, single-server queueing system
[AD-A078190] N80-19569
Theory of the resistive hose instability in relativistic electron beams
[AD-A078189] N80-19636
A theory of anomalous absorption, backscatter and flux limitation in laser produced plasmas
[AD-A075350] N80-19956
Theory of electron cyclotron resonance heating of Tokamak plasmas
[AD-A075362] N80-19957
Magnetosheath effects on cylindrical Langmuir probes
[NASA-CR-162852] N80-19958

NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER, BETHESDA, MD.
Experimental investigation of a circulation control aileron
[AD-A078925] N80-19046
Investigation of [illegible]lled electrical contacts
[AD-A075353] N80-19434
An evaluation [illegible] the two-parameter momentum-integral laminar boundary layer calculation method of head
[AD-A077325] N80-19458
Ice seal for rotating shafts
[AD-A078309] N80-19506
Atlas of Naval operational environments: The natural marine environment
[AD-A077033] N80-19723

NAVAL SURFACE WEAPONS CENTER, DAHLGREN, VA.
Rocket motor blast effects and proposed ablative protection for RAM launching system EX 43
[AD-A077037] N80-19190
Solution of the integer concave program using the ICON algorithm, volume 1
[AD-A077842] N80-19871

NAVAL SURFACE WEAPONS CENTER, WHITE OAK, MD.
Moisture effects on the mechanical properties of Hercules 3501-6 epoxy resin
[AD-A078616] N80-19282
An active filter primer
[AD-A078947] N80-19439
Influence of roughness and blowing on compressible turbulent boundary layer flow
[AD-A077642] N80-19461

NAVAL WEAPONS CENTER, CHINA LAKE, CALIF.
An analysis of the evolution of the reliability and maintainability disciplines N80-19520

NEBRASKA UNIV. - LINCOLN.
Gas phase hydrogen permeation in alpha titanium and carbon steels
[NASA-CR-3190] N80-19236
Scattered radiation fields from rough surfaces full wave solutions N80-19358
Dissociative and double photoionization of CO2 from threshold to 90 A
[NASA-CR-162844] N80-19929

NEW JERSEY INST. OF TECH., NEWARK
Ray optical description of waves guided by integrated dielectric cylinder-cone structures
[AD-A076344] N80-19343

NEW MEXICO STATE UNIV., LAS CRUCES.
Balloon systems and launch support
[AD-A075385] N80-19037
Sounding rocket and balloon systems support
[AD-A075384] N80-19038

NEW MEXICO UNIV., ALBUQUERQUE.
Survivability of remote site alternate energy systems. Volume 1: Survivability analysis
[AD-A078118] N80-19636
Solar powered liquid piston Stirling cycle irrigation pump
[SAN/1894-1] N80-19641

NORSK MARCONI A.S., OSLO.
Multipath analysis of ILS glide path N80-19354

NORTH CAROLINA UNIV. AT CHAPEL HILL.
Nonlinear systems with Gaussian inputs: Representation, identification and inverse problems
[AD-A078697] N80-19900
On the asymptotic distribution of U-statistics
[AD-A078117] N80-19919
Trimming the least squares estimator in the linear model by using a preliminary estimator
[AD-A078115] N80-19920
Robust methods for factorial experiments with outliers
[AD-A077890] N80-19921
On the asymptotic normality of robust regression estimates
[AD-A077888] N80-19922

NORTHEASTERN UNIV., BOSTON, MASS.
An RF oscillator for rocket-borne and balloon-borne quadrupole mass spectrometers
[AD-A078797] N80-19473

NORTHROP CORP., DES PLAINES, ILL.
I/J band low-cost crossed-field amplifier
[AD-A077322] N80-19436

NORTHWESTERN UNIV., EVANSTON, ILL.
Solid state, surface and catalytic properties of oxides
[COO-4987-1] N80-19974

O

OAK RIDGE ASSOCIATED UNIVERSITIES, TENN.
Plans for laser hyperfine structure measurement at UNISOR
[CONF-790976-1] N80-19488

OAK RIDGE NATIONAL LAB., TENN.
A comparison of the results of several heat transfer computer codes when applied to a hypothetical nuclear waste repository
[ORNL/TM-7112] N80-19484
Balancing the generalized eigenvalue problem
[ORNL/CSD-47] N80-19910

OAK RIDGE Y-12 PLANT, TENN.
Use of laser interferometer for position feedback
[Y-2186] N80-19489

OCEAN CITY RESEARCH CORP., N.J.
Corrosion of aluminum alloys in high velocity seawater
[AD-A078435] N80-19251

OHIO STATE UNIV., COLUMBUS.
Cooling liquid He-3 below 1 mK by nuclear demagnetization N80-19311
Asymptotic high frequency techniques for UHF and above antennas
[AD-A077651] N80-19330
Pointing accuracy and dynamic range in a steered beam adaptive array
[AD-A078750] N80-19331
Atmospheric water vapor absorption at 12 CO2 laser frequencies
[NASA-CR-162850] N80-19683
On the problems of construction and statistical inference associated with a generalization of canonical variables N80-19895

OHIO STATE UNIV. RESEARCH FOUNDATION, COLUMBUS.
Methodologies for computer program testing
[AD-A077414] N80-19876

OHIO UNIV., ATHENS.
Analysis of first and second order binary quantized digital phase-locked loops for ideal and white Gaussian noise inputs
[NASA-CR-162854] N80-19056

OKLAHOMA UNIV., NORMAN.
Energy from the west: Impact analysis report. Volume 2. Site-specific and regional impact analyses
[PB80-113574] N80-19855
Dynamic data assimilation by the noise freezing method
[AD-A077901] N80-19711

OPERATIONAL RESEARCH AND ANALYSIS ESTABLISHMENT, OTTAWA (ONTARIO).
Feasibility study on a Canadian civil SAR plan for search and rescue duties
[AD-A075382] N80-19050

OPERATIONS RESEARCH, INC., SILVER SPRING, MD.
Assessment of the risk due to release of carbon fiber in civil aircraft accidents, phase 2 N80-19200

OREGON GRADUATE CENTER FOR STUDY AND RESEARCH, BEAVERTON.
Experimental pulsed laser remote crosswind measurement system. Feasibility study and design, part 5
[AD-A077831] N80-19721

ORION RESEARCH, INC., CAMBRIDGE, MASS.
Water quality monitor
[NASA-CR-160412] N80-19963

P

PACIFIC NORTHWEST ENVIRONMENTAL RESEARCH LAB., CORVALLIS, OREG.
Non-point source - stream nutrient level relationships: A nationwide study. Supplement 1: Nutrient map reliability
[PB80-112691] N80-19579

PANAMETRICS, INC., WALTHAM, MASS.
Design, construction and testing of a magnetic electron spectrometer for detecting electrons to 10 MeV, including a preliminary design for a flight unit
[AD-A078516] N80-19472

PARSONS-BRINCKERHOFF-TUDOR-BECHTEL, SAN FRANCISCO, CALIF.
Potential hydroelectric power, vertical turbine, spillway combine Broadwater Dam
[DOE/ID-01822-1] N80-19681

PEDCO-ENVIRONMENTAL, INC., CINCINNATI, OHIO.
Development of an emission inventory quality assurance program
[PB80-112345] N80-19673

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK.
Small-molecule cyclic models for the synthesis of new polyphosphazenes side group construction via lithiophenoxy derivatives
[AD-A078183] N80-19192
Photochemistry and radiation chemistry of volatile silanes and germanes
[COO-3418-13] N80-19229
Evaluation of a locally homogeneous flow model of spray combustion
[NASA-CR-3202] N80-19293
Turbulent boundary-layer analysis and experimental investigation of erosive burning problem of composite solid propellants
[AD-A077351] N80-19299
Measurement of electron densities in the middle atmosphere using rocket borne blunt probes
[AD-A078148] N80-19686
Kidney cell electrophoresis
[NASA-CR-160555] N80-19782

PENNWALT CORP., KING OF PRUSSIA, PA.
The crystallization thermodynamics of piezoelectric copolymers
[AD-A078705] N80-19276

PERCEPTRONICS, INC., WOODLAND HILLS, CALIF.
Aircraft emergency decisions: Cognitive and situational variables
[AD-A077413] N80-19051

PHYSICAL SCIENCES, INC., WOBURN, MASS.
Coal processing fuel cell utilization. Task 8: H2S removal by calcium-based sorbents
[PSI-TR-167] N80-19300

PITTSBURGH UNIV., PA.
Structure and properties of cast alloys
[AD-A077430] N80-19248
Investigation of weld pool structure and property control in pulsed arc welding
[AD-A078222] N80-19501
Multistate reliability models and some extensions of a univariate shock model N80-19513
Development of a Fe-Pb(Ti) secondary battery system N80-19808
Constructions in geometry problem solving
[AD-A076338] N80-19904
Theory of constructions and set in problem solving
[AD-A076339] N80-19905

POLITECNICO DI MILANO (ITALY).
Generalizations of compactness and cardinal invariants of spaces N80-19925
POLITECNICO DI MILANO (ITALY).
Damping problems in acoustic fatigue N80-19580
POLYTECHNIC INST. OF NEW YORK, FARMINGDALE.
Contributations to signal processing for the hallo program
[AD-A078217] N80-19326
High-frequency signal propagation and scattering in guiding channels N80-19351
Hybrid ray-mode formulation of tropospheric propagation N80-19362
Numerical integration of compressible, viscous flow equations
[AD-A077598] N80-19457
PRATT AND WHITNEY AIRCRAFT GROUP, EAST HARTFORD, CONN.
Core compressor exit stage study. 1: Aerodynamic and mechanical design
[NASA-CR-159714] N80-19113
PRATT AND WHITNEY AIRCRAFT GROUP, WEST PALM BEACH, FLA.
Investigation of fan blades shroud mechanical damping
[AD-A078439] N80-19120
Rejuvenation of turbine blade material by thermal treatment
[AD-A077527] N80-19121
PRINCETON UNIV., N. J.
Solid propellant combustion mechanism research
[AD-A078931] N80-19301
Generalizations of the sequential sign detector
[AD-A078110] N80-19669
Predicting unobservable values and estimating missing ones: A coordinate-free approach, part 2
[AD-A078241] N80-19916
Why do glassy materials possess energy gaps
[AD-A078688] N80-19986
PURDUE UNIV., LAFAYETTE, IND.
Large space system control technology model order reduction study N80-19164
Systems studies of coal conversion processes using a reference simulator
[PE-2275-11] N80-19307
Ground systems for HF antennas
[AD-A077691] N80-19339
Design and analysis of interconnection networks for partitionable parallel processing systems
[AD-A078880] N80-19652

Q

QUEENS UNIV., KINGSTON (ONTARIO).
Leaky coaxial cables for obstacle detection and continuous access guided communications N80-19407

R

RAND CORP., SANTA MONICA, CALIF.
Estimating the time required to transition aircraft fleets to new scheduled maintenance intervals
[AD-A078606] N80-19027
Aircraft icing during low-level flights
[AD-A078643] N80-19052
Measuring technological change in jet fighter aircraft
[AD-A077393] N80-19084
RAYTHEON CO., WALTHAM, MASS.
Dual beam dual mode TWT
[AD-A077576] N80-19433
RCA ADVANCED TECHNOLOGY LABS., CAMDEN, N. J.
Analog binary programmable transversal filter
[AD-A078980] N80-19437
RENSSELAER POLYTECHNIC INST., TROY, N. Y.
The oxidation of graphitic monolayers on Ni(110)
[AD-A078512] N80-19210
Photochemical transients of electrode bound methylene blue
[AD-A078908] N80-19218
The corrosion fatigue behavior of a high purity Al-Zn-Mg-Cu alloy
[AD-A077461] N80-19247
RESEARCH TRIANGLE INST., RESEARCH TRIANGLE PARK, N. C.
Pollutants from synthetic fuels production: Sampling and analysis methods for coal gasification
[PB80-104686] N80-19309
Development and usage of a false color display technique for presenting Seasat-A scatterometer data
[NASA-CR-159203] N80-19662
RHODE ISLAND UNIV., KINGSTON.
Hydrogen entry and transport mechanisms in structural metals
[AD-A078812] N80-19248
General methods to enable robots with vision to acquire, orient and transport workpieces
[PB80-106396] N80-19808
RICE UNIV., HOUSTON, TEX.
Sequential gradient-restoration algorithm for optimal control problems with general boundary conditions N80-19687
ROCKWELL INTERNATIONAL CORP., CANOGA PARK, CALIF.
Space construction and utility distribution N80-19160
Chemically pumped iodine laser
[AD-A078919] N80-19485
ROCKWELL INTERNATIONAL CORP., DOWNEY, CALIF.
High temperature penetrator assembly with bayonet plug and ramp-activated lock
[NASA-CASE-MSC-19526-1] N80-19468
ROCKWELL INTERNATIONAL CORP., THOUSAND OAKS, CALIF.
Ion implanted GaAs integrated circuit process technology
[AD-A078958] N80-19439
ROCKWELL INTERNATIONAL SCIENCE CENTER, THOUSAND OAKS, CALIF.
Surface treatment for aluminum bonding
[AD-A078950] N80-19254
ROHDE AND SCHWARTZ, MUNICH (WEST GERMANY).
Radio-link computations optimize pattern sharing of shortwave antennas N80-19419
ROME AIR DEVELOPMENT CENTER, GRIFFISS AFB, N.Y.
Modes of dielectric waveguides of arbitrary cross-sectional shape
[AD-A077032] N80-19337
Tropospheric refractive studies for SPADATS radar sites
[AD-A077024] N80-19338
A new approach to maintainability prediction N80-19537
Reliability assurance for large scale integrated circuits N80-19542
An analysis of software reliability prediction models N80-19551
ROME AIR DEVELOPMENT CENTER, HANSCOM AFB, MASS.
Recent advances in HF propagation simulation N80-19392
Scatter injection/ducted mode HF radar N80-19398
ROME UNIV. (ITALY).
Vibration damping on San Marco satellites; results and comments N80-19579
Modeling and flight simulation of an active configured aircraft under M.L.S. guidance N80-19845
ROSS (BERND) ASSOCIATES, SAN DIEGO, CALIF.
Development of economical improved thick film solar cell contact
[NASA-CR-162549] N80-19619
ROYAL AIR FORCE, DEREHAM (ENGLAND).
Reliability and support data for statistical evaluation N80-19559
ROYAL AIRCRAFT ESTABLISHMENT, BEDFORD (ENGLAND).
An investigation of the quality of the flow generated by three types of wind tunnel (Ludwieg tube, Evans clean tunnel and injector driven tunnel) N80-19139
ROYAL AIRCRAFT ESTABLISHMENT, FARNBOROUGH (ENGLAND).
Identification experience in extreme flight regimes N80-19102
Contribution of photoelastic analysis to the study of turbo-engine components
[BR71985] N80-19112
Formation of organosilicon compounds. 58: Synthesis of a carbosilane with propellane structure
[RAE-LIB-TRANS-2029] N80-19395
The role of HF in air-ground communications: An overview N80-19373
HF communication to small low flying aircraft N80-19374
Assessment of HF communications reliability N80-19377
Ultrasonic Doppler directional blood flow velocity meter
[RAE-LIB-TRANS-1918] N80-19780
Simulation of a night vision system for low level helicopter operations N80-19632
ROYAL SIGNALS AND RADAR ESTABLISHMENT, MALVERN (ENGLAND).
Difficulties in predicting avionics reliability N80-19521
SIMBOX: A general purpose defense systems simulator N80-19622

S

SAARLAND UNIV., SAARBRUCKEN (WEST GERMANY).
Terrain effects on log-periodic antenna characteristics using the singularity expansion method N80-19349
Theoretical aspects of transient radiation and scattering in lossless two medium half spaces N80-19357
SAN DIEGO STATE UNIV., CALIF.
Research on dynamics of tundra ecosystems and their potential response to energy resource development
[DOE/SF-01525-1] N80-19642
SANDERS ASSOCIATES, INC., NASHUA, N. H.
High temperature solar thermal receiver
[NASA-CR-162831] N80-19621
SANDIA LABS., ALBUQUERQUE, N. MEX.
Lithium battery storage and discharge tests
[SAND-79-0869C] N80-19643
Fields from a vertical magnetic dipole
[SAND-79-0449] N80-19695
Indirect deformation (strain) measurements and calibrations in Sandia triaxial apparatus for rock testing to 250 C
[SAND-79-0114] N80-19696
SANTA CLARA UNIV., CALIF.
Computer applications in remote sensing education N80-20013
SCIENCE APPLICATIONS, INC., EL SEGUNDO, CALIF.
Rain attenuation over Earth-satellite paths
[AD-A075390] N80-19715
SCIENCE APPLICATIONS, INC., IRVINE, CALIF.
Hypersonic interference flow flight experiment design
[AD-A078861] N80-19044
SCIENCE RESEARCH COUNCIL, SLOUGH (ENGLAND).
Ground-wave and sky-wave sea-state sensing experiments in the United Kingdom N80-19400
SCIENCE SPECTRUM, SANTA BARBARA, CALIF.
A biological waste water monitor study using differential laser light scattering from bacteria
[AD-A079527] N80-19665
SCIENTIFIC RESEARCH ASSOCIATES, INC., GLASTONBURY, CONN.
Viscous flow in the region of a rounded trailing edge
[AD-A078568] N80-19045
SCIENTIFIC SYSTEMS, INC., CAMBRIDGE, MASS.
Multispectral cloud identification study
[AD-A077873] N80-19710
SENSOR TECHNOLOGY, INC., CHATSWORTH, CALIF.
Automated array assembly task in-depth study of silicon wafer surface texturizing
[NASA-CR-162883] N80-19618
SERVICE TECHNIQUE DES TELECOMMUNICATIONS DE L'AIR, PARIS (FRANCE).
Reliability improvement due to the application of clauses of operational reliability N80-19530
SHAPE TECHNICAL CENTER, THE HAGUE (NETHERLANDS).
Simulation of air defence operations and multiple air combat N80-19619

SIKORSKY AIRCRAFT, STRATFORD, CONN.
NADC ABC rotor maps
[AD-A078802] N80-19083
SKF INDUSTRIES, INC., KING OF PRUSSIA, PA.
Establishment of engineering design data for hybrid steel/ceramic ball bearings
[AD-A078934] N80-19509
SMITHSONIAN ASTROPHYSICAL OBSERVATORY, CAMBRIDGE, MASS.
Gravitational redshift space-probe experiment
[NASA-CR-161409] N80-19999
SOCIETE METRAVIB, ECULLY (FRANCE).
Report on the use of abatement techniques for problems related to vibrations and noise N80-19583
SOCIETE NATIONALE INDUSTRIELLE AEROSPATIALE, LES MUREAUX (FRANCE).
Fast estimation of three parameters of Weibull law N80-19526
SOCIETE NATIONALE INDUSTRIELLE AEROSPATIALE, MARIGNANE (FRANCE.)
Design of a simulator for studying the helicopter - SDVEH N80-19829
SOCIETE NATIONALE INDUSTRIELLE AEROSPATIALE, TOULOUSE (FRANCE).
New possibilities offered by a radio-inertial hybrid guidance system digital simulation study N80-19636
SOL/LOS, INC., LOS ANGELES, CALIF.
A new method of metallization for silicon solar cells
[NASA-CR-162823] N80-19620
SOUTH CAROLINA UNIV., COLUMBIA.
On the weak law of large numbers D[0,1)
[AD-A078130] N80-19826
SOUTH DAKOTA STATE UNIV., BROOKINGS.
Remote sensing applications to resource problems in South Dakota
[E80-10086] N80-19583
Remote sensing research activities related to academic institutions N80-20008
SOUTHAMPTON UNIV. (ENGLAND).
Prediction of the structural damping of a vibrating stiffened plate N80-19574
SOUTHEASTERN CENTER FOR ELECTRICAL EDUCATION, INC., AUBURN, ALA.
Representation of time dependent mechanical behavior of rene 95 by constitutive equations
[AD-A077271] N80-19250
SOUTHERN RESEARCH INST., BIRMINGHAM, ALA.
Electrostatic precipitations for collection of high resistivity ash
[PB80-112386] N80-19671
Analysis of thermal decomposition products of flue gas conditioning agents
[PB80-111618] N80-19672
SOUTHWEST RESEARCH INST., SAN ANTONIO, TEX.
Fuel quality combustion analysis
[NASA-CR-162822] N80-19284
Diesel engine endurance test with water-containing fire-resistant fuel
[AD-A078665] N80-19287
SRI INTERNATIONAL CORP., ARLINGTON, VA.
The long term impact of atmospheric carbon dioxide on climate
[SAN/115-136/2] N80-19740
SRI INTERNATIONAL CORP., MENLO PARK, CALIF.
Photodissociation and photodetachment of atmospheric negative ions
[AD-A078091] N80-19224
Improved impact fracture resistance in oxidation-toughened Si3n4-20 vol% ZrO2
[AD-A078833] N80-19241
Deflagration-to-detonation transition in HMS based propellants
[AD-A078845] N80-19290
Development of HF skywave radar for remote sensing applications N80-19402
HF skywave radar estimates of the track, surface wind and waves of hurricane Anita N80-19403
Ocean swell parameters from narrow-beam HF radar sea echo N80-19404
Formal methods for achieving reliable software N80-19548
Atmospheric electricity and military operations
[AD-A078482] N80-19693
STANDARD ELEKTRIK LORENZ A.G., PFORZHEIM (WEST GERMANY).
An experimental investigation of multi-path scattering at L-band N80-19370
STANFORD LINEAR ACCELERATOR CENTER, CALIF.
Nuclear phenomena and the short distance structure of hadrons
[SLAC-PUB-2395] N80-19923
STANFORD UNIV., CALIF.
Acoustic microscopy for nondestructive evaluation of materials
[AD-A078098] N80-19516
Research on nondestructive testing
[AD-A078483] N80-19517
A bounding technique for integer linear programming with binary variables
[AD-A075575] N80-19982
Fast algorithms for solving Toeplitz system of equations and finding Rational Hermite Interpolants
[AD-A075376] N80-19901
Langmuir probe measurements of double-layers in a pulsed discharge
[NASA-CR-162945] N80-19954
Study of the electronic surface state of 3-5 compounds
[AD-A078304] N80-19969
STATE UNIV. OF NEW YORK AT BUFFALO.
Global bounds and approximations for nonlinear diffusion problems
[AD-A076343] N80-19507
STENCEL AERO ENGINEERING CORP., ASHEVILLE, N. C.
Prototype development passive, seat-mounted limb retention system
[AD-A076331] N80-19053
STEVENS INST. OF TECH., HOBOKEN, N. J.
FORTRAN program cblique in PL-format user's manual
[AD-A077809] N80-19880
SURREY UNIV., GUILDFORD (ENGLAND).
Electrically short HF aerial systems N80-19418
SYDNEY UNIV. (AUSTRALIA).
Numerical analysis of rafts on visco-elastic media using eigenvector expansions
[PB80-112907] N80-19570
Surface settlement of a finite elastic layer whose modulus increases linearly with depth
[PB80-112899] N80-19571
SYRACUSE UNIV., N. Y.
Electromagnetic transmission through a filed slit of arbitrary cross section in a conducting plane of finite thickness
[AD-A078477] N80-19340
An introduction to the selection and use of simulation languages N80-19810
An introduction to statistical analysis of simulation output data N80-19811
DEFT: Advanced structures and applications
[AD-A075373] N80-19947
SYSTEM DEVELOPMENT CORP., SANTA MONICA, CALIF.
Regional systems development for geothermal energy resources. Pacific region: California and Hawaii. Task 1: Implementation plan development
[DOE/ET-28432-1] N80-19604
Regional systems development for geothermal energy resources. Pacific region: California and Hawaii. Task 2: Regional program monitoring and progress evaluation
[DOE/ET-28432-2] N80-19605
Regional systems development for geothermal energy resources. Pacific region: California and Hawaii. Task 3: Water resources evaluation
[DOE/ET-28432-3/1] N80-19606
Regional systems development for geothermal energy resources. Pacific region: (California and Hawaii). Task 3: Water resources evaluation, appendices
[DOE/ET-28432-3/2] N80-19607
SYSTEMS CONSULTANTS, INC., RIDGECREST, CALIF.
Harpoon pyrotechnic shock study
[AD-A078727] N80-19175
SYSTEMS CONTROL, INC., PALO ALTO, CALIF.
Variable cycle engine multivariable control synthesis: Control structure definition
[AD-A078670] N80-19117
SYSTEMS RESEARCH LABS., INC., DAYTON, OHIO.
Development of a visual inspection technique (optical assessment of aircraft transparencies)
[AD-A079369] N80-19086
Handling quality requirements for advanced aircraft design longitudinal mode
[AD-A077858] N80-19128
SYSTEMS TECHNOLOGY, INC., HAWTHORNE, CALIF.
Development of VTOL flying qualities criteria for low speed and hover
[AD-A078911] N80-19085
Development of aerodynamic disturbance test procedures, volume 1: Executive summary
[PB80-108145] N80-19891
SYSTEMS TECHNOLOGY, INC., MOUNTAIN VIEW, CALIF.
Predicting field of view requirements for VSTOL aircraft approach and landing N80-19847

T

TECHNICAL UNIV. OF DENMARK, LYNGBY.
An experimental study of surface wave propagation on a low permittivity medium N80-19353
Radar altimeter measurements N80-19368
TECHNISCHE HOGESCHOOL, DELFT (NETHERLANDS).
Aspects of flight test instrumentation N80-19098
Analysis of aircraft performance stability and control measures N80-19099
TECHNOLOGY FOR COMMUNICATIONS INTERNATIONAL, MOUNTAIN VIEW, CALIF.
A new computer-controlled High Frequency direction-finding and transmitter locating system N80-19415
TENNESSEE UNIV., KNOXVILLE.
Research in remote signal transmission electronics
[ORNL/SUB-7844/10] N80-19444
TEXAS A&M UNIV., COLLEGE STATION.
Characterization and analysis of reactive organometallic polymers
[AD-A078184] N80-19270
A comparative analysis of Rawinsonde and Nimbus-6 and Tiros-N satellite profile data
[AD-A079295] N80-19737
The determination of atmospheric structure from quantitative satellite data
[AD-A078980] N80-19738
A density-quantile function approach to choosing order statistics for the estimation of location and scale parameters N80-19915
TEXAS INSTRUMENTS, INC., DALLAS.
Binary/analog CCD correlator development
[AD-A077572] N80-19949
TEXAS TECHNOLOGICAL UNIV., LUBBOCK.
Annual review of research under the joint service electronics program
[AD-A077852] N80-20019
TEXAS UNIV., AUSTIN.
Reintroducing the concept of force into relativity theory
[ORO-3992-367] N80-19977
TEXTRON BELL AEROSPACE CO., BUFFALO, N. Y.
An efficient rotational nonequilibrium model of a cw chemical laser
[AD-A078485] N80-19487
THIOKOL CORP., HUNTSVILLE, ALA.
Fourier Transform Infrared Spectroscopy (FTIS). Volume 1: Technical Report
[AD-A079996] N80-19227
Fourier Transform Infrared Spectroscopy (FTIS). Volume 2: User's manual
[AD-A079997] N80-19228
THOMSON-CSF, MALAKOFF (FRANCE).
Methods used for discerning the reliability of military aircraft radar N80-19532
THOMSON-CSF, ORSAY (FRANCE).
Reliability clauses in contracts N80-19528
THOMSON-CSF, PARIS (FRANCE).
Reliability of high-brightness CRTs for airborne displays N80-19643
Quantitative assessments of software reliability N80-19550
TIPPETTS-ABBETT-MCCARTHY-STRATTON, WASHINGTON, D.C.
Cataract hydroelectric development expansion study
[DOE/ID-01796-1] N80-19650

TOULOUSE UNIV. (FRANCE).
Sea-state directional spectra observed by HF Doppler radar N80-19401
TRANSPORTATION SYSTEMS CENTER, CAMBRIDGE, MASS.
Risk assessment of carbon fiber composite in surface transportation N80-19205
TRW DEFENSE AND SPACE SYSTEMS GROUP, REDONDO BEACH, CALIF.
Data reduction and analysis of graphite fiber release experiments [NASA-CR-159032] N80-19048
Monolithic microwave preamplifier [AD-A078522] N80-19441
TRW, INC., CLEVELAND, OHIO.
Exploratory development of die materials for isothermal forging of titanium alloys [AD-A078951] N80-19049
TRW, INC., REDONDO BEACH, CALIF.
Advanced sunflower antenna concept development N80-19147
Surface Accuracy Measurement Sensor for Deployable Reflector Antennas (SAMS DRA) N80-19152

U

UNITED TECHNOLOGIES CORP., EAST HARTFORD, CONN.
Argon/UF6 plasma experiments: UF6 regeneration and product analysis [NASA-CR-3258] N80-19805
UNITED TECHNOLOGIES CORP., SOUTH WINDSOR, CONN.
Advanced technology light weight fuel cell program [NASA-CR-159697] N80-19815
UNITED TECHNOLOGIES RESEARCH CENTER, EAST HARTFORD, CONN.
Investigation of the airflow at rocket trajectory and wind sensor locations of a model helicopter simulating low speed flight. Application of model helicopter testing, laser velocity, and rotor wake flow visualization to investigate the aerodynamic interference at rocket trajectories and wind sensors of a helicopter operating in low speed flight [AD-A075378] N80-19039
Modeling of the hot isostatic pressing process [AD-A079162] N80-19902
UNIVERSITE CATHOLIQUE DE LOUVAIN (BELGIUM).
Mode converters for HF tunnels transmission N80-19406
UNIVERSITY OF CENTRAL FLORIDA, ORLANDO.
Some models for ceiling [AD-A079033] N80-19707
Some additional models for rainfall [AD-A077872] N80-19709
A new model for sky cover [AD-A079368] N80-19717
Some models for windspeed [AD-A077048] N80-19722
Some models for visibility [AD-A075480] N80-19950
UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES.
On the feedback phenomenon of an impinging jet [AD-A078952] N80-19480
Investigation of surface stabilized high-pressure gas discharges [AD-A077040] N80-19483
JOYCE: A language for computer networks [AD-A078706] N80-19879
UNIVERSITY OF SOUTHERN CALIFORNIA, MARINA DEL REY.
A formal definition of AMDL [AD-A079035] N80-19887
UNIVERSITY OF SOUTHWESTERN LOUISIANA, LAFAYETTE.
A modification of Hudson's technique for piecewise linear regression models N80-19894
UNIVERSITY OF WEST FLORIDA, PENSACOLA.
A note on the revised galactic neutron spectrum of the Ames collaborative study [NASA-CR-150554] N80-20002
UOP, INC., DES PLAINES, ILL.
Optimization of Pt-doped Kocite (trade name) electrodes in H3Po4 fuel cells [AD-A075372] N80-19839
UTAH UNIV., SALT LAKE CITY.
Analysis, calculate, and develop techniques for weather satellite imagery data [AD-A077282] N80-19735

V

VARIAN ASSOCIATES, LEXINGTON, MASS.
Slicing of silicon into sheet material. Silicon sheet growth development for the large area silicon sheet task of the low cost solar array project [NASA-CR-162828] N80-19523
VIRGINIA HIGHWAY AND TRANSPORTATION RESEARCH COUNCIL, CHARLOTTESVILLE.
Analyzing historical meteorological data for air quality analysis [PB80-107154] N80-19743
VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG.
An experimental study of highway aerodynamic interference [PB80-109896] N80-19992
VIRGINIA UNIV., CHARLOTTESVILLE.
Human comfort response to random motions with combined yawing and rolling motions [NASA-CR-159187] N80-19802
Experiments on the nuclear interactions of pions [ORO-4043-39] N80-19932
VISIDYNE, INC., BURLINGTON, MASS.
Background Optical Suppression System (BOSS) [AD-A077871] N80-19945
VOUGHT CORP., DALLAS, TEX.
Power system control study. Phase 1: Integrated control techniques [AD-A078629] N80-19125
Erectable/deployable concepts for large space system technology N80-19157

W

WASHINGTON UNIV., SEATTLE.
Coordinated field operation of balloon-borne auroral X-ray experiment from the ATS-F satellite conjugate region [AD-A078041] N80-19685
Field theory of pion-nucleus interactions [DOE/ER-01389-775] N80-19931
Testing quantum chromodynamics in electron-positron annihilation at high energies [DOE/ER-01389-777] N80-19938
WEAPONS SYSTEMS RESEARCH LAB., SALISBURY (AUSTRALIA).
Wind tunnel tests of a spinning 105 mm artillery shell model with canard control surfaces [AR-001-908] N80-19032
WESTINGHOUSE DEFENSE AND ELECTRONIC SYSTEMS CENTER, BALTIMORE, MD.
Reliability growth through environmental simulation N80-19936
Intelligent tracking techniques [AD-A077969] N80-19943
WESTINGHOUSE ELECTRIC CORP., HUNT VALLEY, MD.
Integrated logistics support adds another dimension to matrix management N80-19555
The importance of integrated logistics support considerations during design N80-19557
WESTINGHOUSE ELECTRIC CORP., PITTSBURGH, PA.
Effects of carbon/graphite fiber contamination on high voltage electrical insulation N80-19200
WESTINGHOUSE RESEARCH AND DEVELOPMENT CENTER, PITTSBURGH, PA.
Investigation of weld pool structure and property control in pulsed arc welding [AD-A078222] N80-19501
WESTON OBSERVATORY, MASS.
Investigation of magnetic field phenomena in the ionosphere [AD-A079356] N80-19689
WISCONSIN UNIV. - MADISON.
The effect of nickel and nitrogen on void formation in vanadium N80-19232
An experimental study of surface wave propagation on a low permittivity medium N80-19353
Visible flux variations across finite clouds N80-19699
Initial studies in objective forecasting of mesoscale weather using interactive computer system [AD-A077343] N80-19718
Lidar measurement of boundary layer winds and convective structure [AD-A078690] N80-19719
One-sided continuous dependence of maximal solutions [AD-A079722] N80-19906
Dispersion mapping theorems [AD-A079704] N80-19907
Extensions of the Box-Cox transformation to grouped-data situations N80-19913
Structures in aeronautical phraseology: From English to Spanish N80-19978
WORCESTER POLYTECHNIC INST., MASS.
Channel measurement for wideband digital communication over fading channels N80-19316
Global bounds and approximations for nonlinear diffusion problems [AD-A076343] N80-19507
WYLE LABS., INC., HUNTSVILLE, ALA.
Thermal performance evaluation of the Northrop model NSC-01-0732 concentrating solar collector array at outdoor conditions [NASA-CR-161354] N80-19628
WYOMING UNIV., LARAMIE.
Video processing of remote sensor data applied to uranium exploration in Wyoming [GJBX-171(79)] N80-19603

CONTRACT NUMBER INDEX

Typical Contract Number Index Listing

Listings in this index are arranged alphanumerically by contract number. Under each contract number the NASA accession numbers denoting documents that have been produced as a result of research done under that contract are arranged in ascending order. The NASA accession number denotes the number by which the citation is identified.

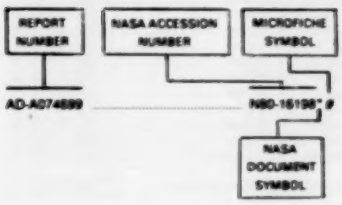
AF PROJ. 138A N80-19070
AF PROJ. 317J N80-19741
AF PROJ. 486U N80-19567
AF PROJ. 648L N80-20021
AF PROJ. 2004 ..... N80-19600
AF PROJ. 2090 ..... N80-19128
AF PROJ. 2103 ..... N80-19636
AF PROJ. 2128 ..... N80-19178
N80-19177
AF PROJ. 2202 ..... N80-19082
AF PROJ. 2303 ..... N80-19253
N80-19291
N80-19429
N80-19487
N80-19568
AF PROJ. 2304 ..... N80-19043
N80-19850
N80-19852
N80-19889
N80-19870
N80-19875
N80-19878
N80-19886
N80-19899
N80-19890
N80-19896
N80-19900
N80-19902
N80-19903
N80-19917
N80-19921
AF PROJ. 2305 ..... N80-19339
N80-19949
AF PROJ. 2306 ..... N80-19337
N80-19516
N80-19967
AF PROJ. 2307 ..... N80-19075
N80-19120
N80-19480
N80-19502
N80-19569
AF PROJ. 2308 ..... N80-19220
N80-19299
N80-19290
AF PROJ. 2310 ..... N80-19473
AF PROJ. 2311 ..... N80-19472
AF PROJ. 2312 ..... N80-19965
AF PROJ. 2313 ..... N80-19051
N80-19086
N80-19788
AF PROJ. 2338 ..... N80-19340
AF PROJ. 2401 ..... N80-19085
AF PROJ. 2402 ..... N80-19066
N80-19505
AF PROJ. 2403 ..... N80-19084
N80-19107
AF PROJ. 2404 ..... N80-19044
N80-19078
AF PROJ. 2419 ..... N80-19209
N80-19211
N80-19240
N80-19244
AF PROJ. 2421 ..... N80-19242
AF PROJ. 2531 ..... N80-19985
AF PROJ. 3006 ..... N80-19117
AF PROJ. 3048 ..... N80-19119
AF PROJ. 3068 ..... N80-19088
N80-19109
N80-19115
N80-19116
N80-19118
AF PROJ. 3145 ..... N80-19079
N80-19125
N80-19429
N80-19443
AF PROJ. 3326 ..... N80-19485
AF PROJ. 4800 ..... N80-19336
N80-19437
N80-19849
AF PROJ. 4843 ..... N80-19890
N80-19891
AF PROJ. 5730 ..... N80-19227
N80-19228
N80-19041
AF PROJ. 6065 ..... N80-19084
AF PROJ. 6190 ..... N80-19707
AF PROJ. 6670 ..... N80-19717
N80-19718
N80-19722
N80-19725
N80-19735
N80-19950
N80-19038
AF PROJ. 6888 ..... N80-19710
AF PROJ. 6898 ..... N80-19951
AF PROJ. 7184 ..... N80-19280
AF PROJ. 7340 ..... N80-19121
AF PROJ. 7351 ..... N80-19249
N80-19089
AF PROJ. 7501 ..... N80-19174
AF PROJ. 7661 ..... N80-19945
AF PROJ. 7670 ..... N80-19209
AF PROJ. 9781 ..... N80-19220
AF-AFOSR-2710-74 ..... N80-19900
AF-AFOSR-2796-75 ..... N80-19921
N80-19922
AF-AFOSR-2978-76 ..... N80-19223
AF-AFOSR-3032-76 ..... N80-19949
AF-AFOSR-3063-77 ..... N80-19890
AF-AFOSR-3063-88 ..... N80-19903
AF-AFOSR-3078-76 ..... N80-19209
AF-AFOSR-3083-76 ..... N80-19889
AF-AFOSR-3161-77 ..... N80-19850
AF-AFOSR-3271-77 ..... N80-19572
N80-19577
N80-19886
AF-AFOSR-3281-77 ..... N80-19902
AF-AFOSR-3418-77 ..... N80-19876
AF-AFOSR-3519-78 ..... N80-19917
AF-AFOSR-3524-78 ..... N80-19043
AF-AFOSR-3559-78 ..... N80-19291
AF-AFOSR-3581-78 ..... N80-19852
AF-AFOSR-3669-78 ..... N80-19487
AF-AFOSR-3726-78 ..... N80-19517
AF-AFOSR-3993-78 ..... N80-19865
AFOSR MIPR R-76-29 ..... N80-19180
AFOSR-75-2796 ..... N80-19919
N80-19920
AF51524005 ..... N80-19789
ARPA ORDER 2684 ..... N80-19326
ARPA ORDER 2752 ..... N80-19327
ARPA ORDER 3223 ..... N80-19944
ARPA ORDER 3291 ..... N80-19884
ARPA ORDER 3384 ..... N80-19438
ARPA ORDER 3569 ..... N80-19518
ARPA ORDER 3718 ..... N80-19459
N80-19926
AT(07-2)-1 ..... N80-19255
DA PROJ. TL2-62209-A-78 ..... N80-19033
DA PROJ. 1L1-61102-AH-43 ..... N80-19295
N80-19455
N80-19899
DA PROJ. 1L1-61102-B-53A N80-19886
DA PROJ. 1L1-61102-B-74A N80-19805
DA PROJ. 1L1-62105-AH-84 ..... N80-19245
N80-19329
DA PROJ. 1L1-62617-AH-19 ..... N80-19721
DA PROJ. 1L1-62618-AH-80 ..... N80-19455
N80-20000
DA PROJ. 1L1-62705-AH-94 ..... N80-19431
N80-19438
N80-19835
DA PROJ. 1L1-62733-AH-20 ..... N80-19829
DA PROJ. 1L4-63317-D-112 ..... N80-19275
DA PROJ. 1T1-61102-AH-48 ..... N80-19498
DA PROJ. 1W8-62618-AH-80 ..... N80-19036
DA PROJ. 1X3-23831-D-880 ..... N80-19440
DA PROJ. 2Q7-61102-B-74F N80-19979
DA PROJ. 8X3-63304-D-215 ..... N80-19500
N80-19870
DAAA25-78-C-0132 ..... N80-19721
DAAB07-77-C-2704 ..... N80-19431
DAAB07-78-C-2935 ..... N80-19851
DAAB07-78-C-2981 ..... N80-19438
DAAG07-78-C-0584 ..... N80-19835
DAAG29-75-C-0024 ..... N80-19908
N80-19907
DAAG29-76-C-0023 ..... N80-19224
DAAG29-78-D-0100 ..... N80-19898
DAAG29-78-G-0079 ..... N80-19737
N80-19738
DAAG29-78-G-0057 ..... N80-19398
DAAG29-78-G-0158 ..... N80-19719
DAAG29-78-G-0184 ..... N80-19336
DAAG29-78-G-0223 ..... N80-19288
DAAG29-78-G-0239 ..... N80-19507
DAAG29-78-G-0280 ..... N80-19222
DAAG29-78-G-0310 ..... N80-19219
DAAG29-78-G-0311 ..... N80-19248
DAAG29-77-C-0013 ..... N80-19039
DAAG29-77-G-0072 ..... N80-19457
DAAG29-77-G-0094 ..... N80-19343
DAAG29-78-G-0048 ..... N80-19881
DAAG29-78-G-0088 ..... N80-19952
DAAG29-78-G-0206 ..... N80-19873
DAAG46-77-C-0027 ..... N80-19329
DAAG46-78-C-0008 ..... N80-19080
DAAG53-76-C-0003 ..... N80-19297
DAAG53-76-C-0014 ..... N80-19839
DAAG53-76-C-0136 ..... N80-19882
N80-19887
DAAG53-76-C-0182 ..... N80-19947
DAAK02-74-C-0069 ..... N80-19969
DAAK10-78-C-0274 ..... N80-19254
DAAK11-78-C-0003 ..... N80-19295
DAAK70-77-C-0186 ..... N80-19801
DAAK70-78-C-0001 ..... N80-19287
DAAK70-78-C-0158 ..... N80-19333
DAAK70-78-C-0167 ..... N80-19943
DAAK70-78-C-0229 ..... N80-19478
DAEA18-71-A-0204 ..... N80-19224
DAHC04-73-C-0015 ..... N80-19224
DAHC15-72-C-0305 ..... N80-19887
DAHC19-78-C-0045 ..... N80-19979
DARPA ORDER 2182 ..... N80-19969
DARPA ORDER 3206 ..... N80-19892
N80-19897
DARPA ORDER 3817 ..... N80-19482
DE-AC03-79ET-23041 ..... N80-19662

DE-AC04-79ET-23005 N80-19923
DEAC06-79RL-05761 N80-19492
DENS-83 N80-19812
DI-BM-HO-198198 N80-19475
DNA PROJ. NWED-QAXH002 N80-19688
DNA001-79-C-0295 N80-19474
DOT-AS-89019 N80-19989
DOT-AS-900019 N80-19990
DOT-CG-842923-A N80-19059
DOT-FA77WA-3964 N80-19130
DOT-FA79WA-4293 N80-19054
DOT-HS-7-01590 N80-19992
DOT-HS-7-01716 N80-19991
EC-77-A-31-1062 N80-19626
EE-77-S-03-1535 N80-19642
EF-77-S-02-2656 N80-19393
EG-77-C-01-4042 N80-19945
EG-77-C-02-4268 N80-19297
EPA-R-804979 N80-19309
EPA-R-805294 N80-19674
EPA-68-01-1916 N80-19865
EPA-68-02-2167 N80-19310
EPA-68-02-2193 N80-19671
EPA-68-02-2200 N80-19672
EPA-68-02-2467 N80-19669
EPA-68-02-2585 N80-19673
EPA-68-02-2601 N80-19679
EPA-68-02-2744 N80-19670
EPA-68-02-2836 N80-19677
EPA-68-03-2223 N80-19993
EPRI PROJ. 1139-1 N80-19855
N80-19858
N80-19857
ER-78-S-02-4987 N80-19974
ET-77-C-01-2577 N80-19308
ET-78-C-01-3205 N80-19213
ET-78-C-03-1530 N80-19604
N80-19805
N80-19838
N80-19807
ET-78-G-03-1694 N80-19841
ET-78-S-01-3177 N80-19302
EW-78-A-21-9450 N80-19300
EW-78-F-07-1798 N80-19650
EW-78-F-07-1822 N80-19651
EX-76-A-29-1080 N80-19812
EX-76-C-01-2028 N80-19292
EX-76-C-01-2275 N80-19307
EX-76-C-01-2361 N80-19306
EX-76-C-01-2422 N80-19304
EX-76-C-01-2433 N80-19305
EX-76-C-01-2449 N80-19298
EX-76-I-01-1029 N80-19813
EX-76-S-01-2516 N80-19293
EX-77-A-29-1010 N80-19814
EY-76-C-02-0016 N80-19284
N80-19654
N80-19830
EY-76-C-02-4094 N80-19649
EY-76-C-03-0115 N80-19740
EY-76-C-03-0515 N80-19833
EY-76-C-04-0613 N80-19258
N80-19445
EY-76-C-04-0789 N80-19643
N80-19695
N80-19696
EY-76-C-05-0033 N80-19647
EY-76-C-06-1388 N80-19831
N80-19838
EY-76-C-06-1830 N80-19666
N80-19667
N80-19839
EY-76-C-07-1570 N80-19477
N80-19802
EY-76-C-09-0001 N80-19255
N80-19478
EY-76-C-13-1648 N80-19803
EY-76-C-14-2170 N80-19304
EY-76-S-02-1340 N80-19144
EY-76-S-02-3416 N80-19229
EY-76-S-05-3443 N80-19911
EY-76-S-05-3992 N80-19077
EY-76-S-05-4043 N80-19932
F(05-1)-1648 N80-19103
F04611-78-C-0027 N80-19227
N80-19228
F04701-78-C-0079 N80-19189
F04703-77-C-0111 N80-19335
F09603-77-A-0204 N80-19081
F19628-76-C-0147 N80-19674
F19628-76-C-0171 N80-19038
F19628-76-C-0178 N80-19688
F19628-76-C-0256 N80-19473
F19628-76-C-0291 N80-19689
F19628-77-C-0001 N80-19037
F19628-77-C-0080 N80-19797
N80-19709
N80-19717
N80-19722
N80-19850
F19628-77-C-0180 N80-19472
F19628-77-C-0199 N80-19867
F19628-77-C-0258 N80-19710
F19628-77-C-0260 N80-19437
F19628-78-C-0001 N80-19324
F19628-78-C-0002 N80-19177
N80-19327
N80-19970
N80-20021
F19628-78-C-0011 N80-19891
F19628-78-C-0057 N80-19339
F19628-78-C-0122 N80-19849
F19628-78-C-0130 N80-19735
F19628-78-C-0137 N80-19718
F19628-78-C-0195 N80-19690
F19628-78-C-0219 N80-19473
F19628-78-C-0005 N80-19945
F19628-79-M-0015 N80-19334
F19628-80-C-0002 N80-19176
F29601-76-C-0015 N80-19836
F29601-78-C-0023 N80-19485
F30602-77-C-0178 N80-19844
F30602-78-C-0008 N80-19867
F30602-78-C-0103 N80-19865
F30602-79-C-0011 N80-19340
F33615-74-C-5114 N80-19239
F33615-75-C-3016 N80-19268
F33615-75-C-3105 N80-19082
F33615-76-C-2082 N80-19109
N80-19115
N80-19118
F33615-76-C-3113 N80-19567
F33615-76-C-5105 N80-19249
F33615-76-C-5185 N80-19280
F33615-76-C-5208 N80-19121
F33615-77-C-0535 N80-19086
F33615-77-C-2042 N80-19119
F33615-77-C-2086 N80-19120
F33615-77-C-2096 N80-19117
F33615-77-C-3011 N80-19128
F33615-77-C-3043 N80-19044
F33615-77-C-3054 N80-19076
F33615-77-C-3067 N80-19084
F33615-77-C-3117 N80-19443
F33615-77-C-5003 N80-19250
F33615-77-C-5039 N80-19211
F33615-78-C-2018 N80-19125
F33615-78-C-2041 N80-19118
F33615-78-C-2085 N80-19429
F33615-78-C-3404 N80-19066
F33615-78-C-3412 N80-19075
F33615-78-C-3614 N80-19107
F33615-78-C-5002 N80-19342
F33615-78-C-5105 N80-19948
F33657-71-C-0567 N80-19105
F33657-78-C-0473 N80-19843
F49620-76-C-0003 N80-19670
N80-19896
F49620-77-C-0022 N80-19694
F49620-77-C-0023 N80-19027
N80-19052
N80-19084
F49620-77-C-0039 N80-19290
F49620-77-C-0087 N80-19438
F49620-77-C-0099 N80-19669
F49620-78-C-0016 N80-19289
F49620-78-C-0060 N80-19460
F49620-78-C-0067 N80-19051
F49620-78-C-0090 N80-19502
F49620-78-C-0096 N80-19665
F49620-78-C-0098 N80-19516
F49620-78-C-0119 N80-19224
F49620-79-C-0082 N80-19253
F49620-79-C-0115 N80-19675
F49620-79-C-0140 N80-19926
GA PROJ. 3257 N80-19462
HDL PROJ. 692764 N80-19440
JPL-954374 N80-19623
JPL-954995 N80-19617
JPL-955130 N80-19148
JPL-955184 N80-19619
JPL-955200 N80-19942
JPL-955209 N80-19625
JPL-955210 N80-19622
JPL-955296 N80-19618
JPL-955319 N80-19620
JPL-955454 N80-19621
JPL-955458 N80-19683
JPL-955543 N80-19321
JPL-995209 N80-19624
NAONR-19-80 N80-19243
NASA ORDER H-34373-B N80-19995
NASA ORDER L-17098-A N80-19332
NASA ORDER L-81248-A N80-19204
NASA ORDER W-14252 N80-19958
NASW-3196 N80-19320
N80-19447
N80-19452
N80-19705
N80-19998
NASW-3199 N80-19111
N80-19133
N80-19207
N80-19451
N80-19453
N80-19565
N80-19749
N80-19750
N80-19751
N80-19752
N80-19753
N80-19783
N80-19784
N80-19785
N80-19786
N80-19787
N80-19801
NAS1-13741 N80-19791
NAS1-13792 N80-19549
NAS1-14031 N80-19588
NAS1-14329 N80-19835
NAS1-14449 N80-19083
NAS1-14849 N80-19030
NAS1-14908 N80-19802
NAS1-15009 N80-19206
NAS1-15220 N80-19152
NAS1-15339 N80-19982
NAS1-15379 N80-19200
NAS1-15485 N80-19048
NAS1-15763 N80-19151
NAS2-9430 N80-19055
NAS2-10096 N80-19800
NAS2-10343 N80-19448
NAS3-20092 N80-19185
NAS3-20578 N80-19113
NAS3-21257 N80-19815
NAS3-21582 N80-19450
NAS3-21587 N80-19284
NAS7-100 N80-19148
N80-19183
N80-19323
N80-19499
N80-19578
N80-19611
N80-19623
N80-19632
N80-19633
N80-19634
N80-19983
N80-19996
NAS8-27969 N80-19999
NAS8-30560 N80-19684
NAS8-32036 N80-19627
N80-19629
N80-19629
NAS8-32093 N80-19630
NAS8-32329 N80-19795
N80-19796
N80-19797
N80-19798
N80-19799
NAS8-32897 N80-19704
NAS8-33095 N80-19703
NAS8-33100 N80-19141
NAS8-33106 N80-19682
NAS8-33215 N80-20001
NAS8-33382 N80-19861
NAS8-33430 N80-19426
NAS8-33431 N80-19157
NAS8-33432 N80-19168

NAS8-33452 ..... N80-19186
NAS8-33674 ..... N80-19179
NAS9-14229 ..... N80-19863
NAS9-15417 ..... N80-20002
NAS9-15584 ..... N80-19782
NAS9-15836 ..... N80-19615
N80-19631
NAS9-15678 ..... N80-19144
NAS9-15795 ..... N80-19322
N80-19427
NAS9-15800 ..... N80-19586
N80-19587
NGL-05-020-176 ..... N80-19954
NGL-23-004-083 ..... N80-19592
NGL-42-003-007 ..... N80-19580
NGR-28-004-021 ..... N80-19629
NGR-28-004-025 ..... N80-19236
NGR-36-009-017 ..... N80-19056
NGR-39-009-077 ..... N80-19283
NR PROJ. 012-724 ..... N80-19685
NR PROJ. 048-647 ..... N80-19879
NR PROJ. 049-345 ..... N80-19853
NR PROJ. 056-681 ..... N80-19221
NR PROJ. 092-516 ..... N80-19301
NR PROJ. 157-408 ..... N80-19904
NRL PROJ. M05-12 ..... N80-19277
NRL PROJ. P03-19 ..... N80-19277
NRL PROJ. R08-93 ..... N80-19459
NRL PROJ. S02-43.801 ..... N80-19281
NRL PROJ. 67H02-58A N80-19956
NSF APR-74-13935 ..... N80-19808
NSF ATM-78-08440 ..... N80-19954
NSF CHE-76-10896 ..... N80-19955
NSF CHE-77-22152 ..... N80-19955
NSF DAR-14-13935 ..... N80-19808
NSF DMR-78-03015 ..... N80-19968
NSF DMR-79-04155 ..... N80-19442
NSF ENG-75-16174 ..... N80-19348
NSF ENG-76-17145 ..... N80-19949
NSF ENG-77-12946 ..... N80-19903
NSF ENG-78-15231 ..... N80-19988
NSF MCS 77-04828 ..... N80-19965
NSF MCS-76-81259 ..... N80-19982
NSF MCS-77-01193 ..... N80-19984
NSF MCS-77-02194 ..... N80-19981
NSF MCS-77-04828 ..... N80-19891
NSF MCS-77-05314 ..... N80-19984
NSF MCS-77-07569 ..... N80-19927
N80-19941
NSF MCS-77-23738 ..... N80-19901
NSF MCS-78-01240 ..... N80-19920
N80-19922
NSF MCS-78-07244 ..... N80-19907
NSF MCS-78-09525 ..... N80-19908
NSF OCE-78-00611 ..... N80-19724
NSG-1150 ..... N80-19449
NSG-1448 ..... N80-19026
NSG-1499 ..... N80-19584
NSG-1609 ..... N80-19480
NSG-2289 ..... N80-19792
NSG-2288 ..... N80-19454
NSG-3018 ..... N80-19609
NSG-3028 ..... N80-19108
N00014-67-A-0103-0039 ..... N80-19685
N00014-74-C-0407 ..... N80-19508
N00014-75-C-0099 ..... N80-19687
N00014-75-C-0201 ..... N80-19724
N00014-75-C-0266 ..... N80-19953
N00014-75-C-0486 ..... N80-19247
N00014-75-C-0643 ..... N80-19596
N80-19793
N80-19864
N80-19865
N80-19866
N80-19891
N80-19927
N80-19941
N80-19946
N00014-75-C-0648 ..... N80-19442
N80-19886
N00014-75-C-0661 ..... N80-19226
N80-19866
N80-19884
N00014-75-C-0685 ..... N80-19192
N00014-75-C-0693 ..... N80-19273
N00014-75-C-0705 ..... N80-19301
N00014-75-C-0730 ..... N80-19210
N00014-75-C-0800 ..... N80-19246
N00014-76-C-0144 ..... N80-19326
N00014-76-C-0214 ..... N80-19637
N00014-76-C-0279 ..... N80-19903
N00014-76-C-0330 ..... N80-19901
N00014-76-C-0346 ..... N80-19902
N00014-76-C-0394 ..... N80-19736
N00014-76-C-0408 ..... N80-19274
N00014-76-C-0418 ..... N80-19882
N00014-76-C-0657 ..... N80-19241
N00014-76-C-0836 ..... N80-19225
N80-19955
N80-20019
N80-19880
N80-19458
N80-19035
N80-19442
N00014-76-C-1136 ..... N80-19276
N00014-77-C-0062 ..... N80-19279
N00014-77-C-0073 ..... N80-19693
N00014-77-C-0084 ..... N80-19470
N00014-77-C-0085 ..... N80-19783
N00014-77-C-0139 ..... N80-19270
N00014-77-C-0213 ..... N80-19501
N00014-77-C-0326 ..... N80-19441
N00014-77-C-0389 ..... N80-19966
N80-19879
N80-19114
N80-19904
N80-19905
N80-19923
N00014-77-C-0426 ..... N80-19218
N00014-77-C-0596 ..... N80-19221
N00014-77-C-0645 ..... N80-19269
N00014-77-C-0711 ..... N80-19272
N00014-77-C-0714 ..... N80-19251
N00014-77-G-0069 ..... N80-19433
N00014-78-C-0022 ..... N80-19804
N80-19916
N80-19509
N80-19045
N80-19331
N80-19143
N80-19715
N80-19549
N80-19175
N80-19330
N80-19124
N00014-78-C-0213 ..... N80-19484
N00014-78-C-0494 ..... N80-19483
N00014-78-C-0496 ..... N80-19739
N00014-78-C-0676 ..... N80-19711
N80-19595
N80-19599
N80-19598
N80-19087
N80-19081
N80-19072
N80-19073
N80-19053
N80-19085
N80-19123
N80-19504
N80-19252
N80-19435
N80-19062
N80-19432
N80-19624
N80-19083
N80-19049
N80-19587
N80-19314
N80-19672
N80-19324
N80-19305
N80-19441
N80-19221
N80-19888
N80-19904
N80-19905
N80-19898
N80-19106
N80-19668
N80-19697
N80-19873
N80-19408
N80-19444
N80-19464
N80-19488
N80-19489
N80-19910
N80-19299
N80-19463
N00014-78-C-0720 ..... N80-19791
N00014-78-C-0791 ..... N80-19260
N00014-78-C-0260 ..... N80-19322
N00014-78-C-0322 ..... N80-19304
N00019-78-C-0304 ..... N80-19470
N00019-78-C-0470 ..... N80-19291
N00019-78-C-0291 ..... N80-19384
N00024-78-C-5384 ..... N80-19136
N00039-79-C-0136 ..... N80-19195
N00123-76-C-0195 ..... N80-19340
N00123-76-C-0340 ..... N80-19371
N00123-76-C-1371 ..... N80-19072
N00140-76-C-1072 ..... N80-19087
N00173-78-C-0087 ..... N80-19440
N00173-78-C-0440 ..... N80-19129
N00228-76-C-2129 ..... N80-19056
N00228-77-C-3056 ..... N80-19164
N00228-77-C-3164 ..... N80-19009
N80530-78-C-0009 ..... N80-19598
N80530-79-R-0036 ..... N80-19087
N80921-78-C-0014 ..... N80-19081
N62269-76-C-0342 ..... N80-19072
N80-19073
N80-19053
N80-19085
N62269-77-C-0251 ..... N80-19123
N62269-77-C-0278 ..... N80-19504
N62269-77-C-0352 ..... N80-19252
N62269-77-C-0478 ..... N80-19435
N62269-78-C-0200 ..... N80-19062
N62269-78-C-0213 ..... N80-19432
N62269-78-C-0267 ..... N80-19624
N62269-78-C-0312 ..... N80-19083
N62269-79-C-0020 ..... N80-19049
N62269-79-M-3221 ..... N80-19587
N66269-78-C-0191 ..... N80-19314
PROJ. AGRISTARS N80-19672
PROJ. 1HR-604 ..... N80-19324
PROJ. 3832-27 ..... N80-19305
PROJ. 5720 ..... N80-19441
PROJ. 61014 ..... N80-19221
RF5481001 ..... N80-19888
RR0130801 ..... N80-19904
RR0140941 ..... N80-19905
RR0420602 ..... N80-19898
RR0520602 ..... N80-19106
SF33334145 ..... N80-19668
SF55525401 ..... N80-19697
W-31-109-ENG-38 ..... N80-19873
N80-19408
W-7405-ENC-48 ..... N80-19444
W-7405-ENG-26 ..... N80-19464
N80-19488
N80-19489
N80-19910
W-7405-ENG-36 ..... N80-19299
N80-19463
W-7405-ENG-48 ..... N80-19648
N80-19654
N80-19837
N80-19960
N80-19214
N80-19230
N80-19295
N80-19446
N80-19908
N80-19959
N80-19961
N80-19962
N80-19871
N80-19972
WF140000 ..... N80-19053
WF41400000 ..... N80-19504
WF41421000 ..... N80-19046
WF52551792 ..... N80-19739
WF82580000 ..... N80-19432
WR0220401 ..... N80-19282
W0476110 ..... N80-19439
W0598000 ..... N80-19278
XF21241021 ..... N80-19668
ZF51524004 ..... N80-19106
ZF52551792 ..... N80-19711
ZF57571001 ..... N80-19640
ZF61412001 ..... N80-19434
ZR0220601 ..... N80-19508
146-60-02-01 ..... N80-19142
505-04 ..... N80-19485
505-10-13-07 ..... N80-19030
505-11-41 ..... N80-19126
505-31-53-01 ..... N80-19131
506-35-21 ..... N80-19792
506-41-13-02 ..... N80-19023
506-51-13-01 ..... N80-19031
506-53-53-03 ..... N80-19563
516-58-11 ..... N80-19127
530-03-13-02 ..... N80-19024
532-02-11 ..... N80-19022
534-03-23-01 ..... N80-19193
542-01-13-05 ..... N80-19145
683-04-00 ..... N80-20003

REPORT/ACCESSION NUMBER INDEX

Typical Report/Accession Number Index Listing



Listings in this index are arranged alphanumerically by report number. The NASA accession number denotes the number by which the citation is identified. An asterisk (*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche.

A-7755 ..... N80-20003* #
A-7801 ..... N80-19128* #
A-7957 ..... N80-19127* #
A-7986 ..... N80-19022* #
A-8075 ..... N80-19025* #
A-8083 ..... N80-19792* #

A/V-84818-1 ..... N80-19035 #

AAE-TR-79-5 ..... N80-19487 #

ACUREX-FR-79-340 ..... N80-19625* #

AD-A070523 ..... N80-19471* #
AD-A075324 ..... N80-19899 #
AD-A075326 ..... N80-19285 #
AD-A075350 ..... N80-19956 #
AD-A075353 ..... N80-19434 #
AD-A075356 ..... N80-19889 #
AD-A075362 ..... N80-19957 #
AD-A075363 ..... N80-19482 #
AD-A075365 ..... N80-19036 #
AD-A075371 ..... N80-19286 #
AD-A075372 ..... N80-19639 #
AD-A075373 ..... N80-19947 #
AD-A075376 ..... N80-19801 #
AD-A075377 ..... N80-19476 #
AD-A075378 ..... N80-19039 #
AD-A075379 ..... N80-19035 #
AD-A075383 ..... N80-19874 #
AD-A075384 ..... N80-19038 #
AD-A075385 ..... N80-19037 #
AD-A075390 ..... N80-19715 #
AD-A075392 ..... N80-19050 #
AD-A075490 ..... N80-19950 #
AD-A075575 ..... N80-19882 #
AD-A076304 ..... N80-19969 #
AD-A076306 ..... N80-19341 #
AD-A076307 ..... N80-19342 #
AD-A076308 ..... N80-19506 #
AD-A076322 ..... N80-19191 #
AD-A076325 ..... N80-19806 #
AD-A076331 ..... N80-19053 #
AD-A076334 ..... N80-19211 #
AD-A076335 ..... N80-19881 #
AD-A076336 ..... N80-19736 #
AD-A076338 ..... N80-19904 #
AD-A076339 ..... N80-19905 #
AD-A076340 ..... N80-19600 #
AD-A076342 ..... N80-19601 #
AD-A076343 ..... N80-19507 #
AD-A076344 ..... N80-19343 #
AD-A076345 ..... N80-19344 #
AD-A076350 ..... N80-19892 #
AD-A076370 ..... N80-19569 #
AD-A076950 ..... N80-19254 #
AD-A077022 ..... N80-19725 #
AD-A077023 ..... N80-19691 #
AD-A077024 ..... N80-19338 #
AD-A077025 ..... N80-19599 #
AD-A077026 ..... N80-19690 #
AD-A077029 ..... N80-19136 #
AD-A077030 ..... N80-19484 #
AD-A077031 ..... N80-19724 #
AD-A077032 ..... N80-19337 #
AD-A077033 ..... N80-19723 #
AD-A077037 ..... N80-19190 #
AD-A077040 ..... N80-19483 #
AD-A077043 ..... N80-19958* #
AD-A077047 ..... N80-19070 #
AD-A077048 ..... N80-19722 #
AD-A077049 ..... N80-19177 #
AD-A077050 ..... N80-19071 #
AD-A077053 ..... N80-19692 #
AD-A077060 ..... N80-19435 #
AD-A077061 ..... N80-19951 #
AD-A077115 ..... N80-19455 #
AD-A077167 ..... N80-19334 #
AD-A077169 ..... N80-19086 #
AD-A077178 ..... N80-19335 #
AD-A077181 ..... N80-19107 #
AD-A077194 ..... N80-19474 #
AD-A077196 ..... N80-19040 #
AD-A077223 ..... N80-19504 #
AD-A077271 ..... N80-19250 #
AD-A077276 ..... N80-19290 #
AD-A077292 ..... N80-19735 #
AD-A077322 ..... N80-19436 #
AD-A077324 ..... N80-19281 #
AD-A077325 ..... N80-19456 #
AD-A077343 ..... N80-19718 #
AD-A077351 ..... N80-19289 #
AD-A077358 ..... N80-19970 #
AD-A077361 ..... N80-19741 #
AD-A077364 ..... N80-19332* #
AD-A077368 ..... N80-19105 #
AD-A077389 ..... N80-19877 #
AD-A077393 ..... N80-19084 #
AD-A077394 ..... N80-19949 #
AD-A077398 ..... N80-19875 #
AD-A077399 ..... N80-19291 #
AD-A077406 ..... N80-19253 #
AD-A077407 ..... N80-19189 #
AD-A077413 ..... N80-19051 #
AD-A077414 ..... N80-19876 #
AD-A077415 ..... N80-19209 #
AD-A077427 ..... N80-19850 #
AD-A077430 ..... N80-19248 #
AD-A077435 ..... N80-19187 #
AD-A077453 ..... N80-19242 #
AD-A077457 ..... N80-19475 #
AD-A077460 ..... N80-19087 #
AD-A077461 ..... N80-19247 #
AD-A077475 ..... N80-19088 #
AD-A077479 ..... N80-19049 #
AD-A077524 ..... N80-19923 #
AD-A077525 ..... N80-19886 #
AD-A077526 ..... N80-19872 #
AD-A077527 ..... N80-19121 #
AD-A077531 ..... N80-19122 #
AD-A077536 ..... N80-19277 #
AD-A077548 ..... N80-19041 #
AD-A077551 ..... N80-19058 #
AD-A077554 ..... N80-19598 #
AD-A077557 ..... N80-19712 #
AD-A077558 ..... N80-19457 #
AD-A077572 ..... N80-19849 #
AD-A077574 ..... N80-19508 #
AD-A077576 ..... N80-19433 #
AD-A077589 ..... N80-20021 #
AD-A077592 ..... N80-19429 #
AD-A077615 ..... N80-19252 #
AD-A077622 ..... N80-19788 #
AD-A077631 ..... N80-19721 #
AD-A077641 ..... N80-19878 #
AD-A077642 ..... N80-19461 #
AD-A077648 ..... N80-19059 #
AD-A077651 ..... N80-19330 #
AD-A077652 ..... N80-20019 #
AD-A077661 ..... N80-19129 #
AD-A077672 ..... N80-19518 #
AD-A077675 ..... N80-19244 #
AD-A077688 ..... N80-19081 #
AD-A077690 ..... N80-19115 #
AD-A077691 ..... N80-19339 #
AD-A077693 ..... N80-19043 #
AD-A077704 ..... N80-19109 #
AD-A077711 ..... N80-19080 #
AD-A077712 ..... N80-19116 #
AD-A077727 ..... N80-19720 #
AD-A077803 ..... N80-19275 #
AD-A077804 ..... N80-19082 #
AD-A077809 ..... N80-19880 #
AD-A077842 ..... N80-19871 #
AD-A077858 ..... N80-19128 #
AD-A077859 ..... N80-19567 #
AD-A077869 ..... N80-19943 #
AD-A077870 ..... N80-19686 #
AD-A077871 ..... N80-19945 #
AD-A077872 ..... N80-19709 #
AD-A077873 ..... N80-19710 #
AD-A077876 ..... N80-19955 #
AD-A077877 ..... N80-20018 #
AD-A077884 ..... N80-19968 #
AD-A077885 ..... N80-19240 #
AD-A077886 ..... N80-19225 #
AD-A077888 ..... N80-19822 #
AD-A077890 ..... N80-19821 #
AD-A077891 ..... N80-19268 #
AD-A077894 ..... N80-19635 #
AD-A077896 ..... N80-19969 #
AD-A077899 ..... N80-19896 #
AD-A077900 ..... N80-19054 #
AD-A077901 ..... N80-19711 #
AD-A077902 ..... N80-19595 #
AD-A077907 ..... N80-19174 #
AD-A077908 ..... N80-19538 #
AD-A077915 ..... N80-19327 #
AD-A077918 ..... N80-19271 #
AD-A077954 ..... N80-19803 #
AD-A077994 ..... N80-19979 #
AD-A078003 ..... N80-19222 #
AD-A078005 ..... N80-19868 #
AD-A078006 ..... N80-19944 #
AD-A078019 ..... N80-19430 #
AD-A078022 ..... N80-19324 #
AD-A078031 ..... N80-19706 #
AD-A078033 ..... N80-19707 #
AD-A078035 ..... N80-19867 #
AD-A078037 ..... N80-19221 #
AD-A078039 ..... N80-19239 #
AD-A078041 ..... N80-19885 #
AD-A078043 ..... N80-19208 #
AD-A078048 ..... N80-19481 #
AD-A078055 ..... N80-19864 #
AD-A078056 ..... N80-19694 #
AD-A078058 ..... N80-19637 #
AD-A078060 ..... N80-19866 #
AD-A078061 ..... N80-19827 #
AD-A078062 ..... N80-19946 #
AD-A078063 ..... N80-19941 #
AD-A078069 ..... N80-19804 #
AD-A078082 ..... N80-19687 #
AD-A078087 ..... N80-19897 #
AD-A078088 ..... N80-19516 #
AD-A078089 ..... N80-19870 #
AD-A078090 ..... N80-19220 #
AD-A078091 ..... N80-19224 #
AD-A078110 ..... N80-19889 #

AD-A078115 ..... N80-19920 #
AD-A078117 ..... N80-19919 #
AD-A078118 ..... N80-19836 #
AD-A078122 ..... N80-19236 #
AD-A078123 ..... N80-19793 #
AD-A078124 ..... N80-19865 #
AD-A078125 ..... N80-19470 #
AD-A078130 ..... N80-19926 #
AD-A078134 ..... N80-19084 #
AD-A078137 ..... N80-19917 #
AD-A078148 ..... N80-19886 #
AD-A078154 ..... N80-19503 #
AD-A078155 ..... N80-19298 #
AD-A078157 ..... N80-19588 #
AD-A078159 ..... N80-19960 #
AD-A078162 ..... N80-19902 #
AD-A078183 ..... N80-19192 #
AD-A078184 ..... N80-19270 #
AD-A078188 ..... N80-19273 #
AD-A078189 ..... N80-19836 #
AD-A078190 ..... N80-19868 #
AD-A078203 ..... N80-19134 #
AD-A078214 ..... N80-19190 #
AD-A078216 ..... N80-19065 #
AD-A078217 ..... N80-19328 #
AD-A078218 ..... N80-20000 #
AD-A078220 ..... N80-19896 #
AD-A078222 ..... N80-19501 #
AD-A078234 ..... N80-19257 #
AD-A078237 ..... N80-19274 #
AD-A078238 ..... N80-19429 #
AD-A078240 ..... N80-19272 #
AD-A078241 ..... N80-19918 #
AD-A078242 ..... N80-19223 #
AD-A078243 ..... N80-19399 #
AD-A078264 ..... N80-19967 #
AD-A078268 ..... N80-19981 #
AD-A078271 ..... N80-19034 #
AD-A078273 ..... N80-19747 #
AD-A078275 ..... N80-19500 #
AD-A078278 ..... N80-19057 #
AD-A078281 ..... N80-19848 #
AD-A078282 ..... N80-19746 #
AD-A078283 ..... N80-19918 #
AD-A078286 ..... N80-19325 #
AD-A078287 ..... N80-19328 #
AD-A078289 ..... N80-19135 #
AD-A078291 ..... N80-19089 #
AD-A078322 ..... N80-19853 #
AD-A078332 ..... N80-19713 #
AD-A078363 ..... N80-19716 #
AD-A078368 ..... N80-19717 #
AD-A078371 ..... N80-19948 #
AD-A078412 ..... N80-19188 #
AD-A078413 ..... N80-19226 #
AD-A078414 ..... N80-19984 #
AD-A078417 ..... N80-19891 #
AD-A078418 ..... N80-19586 #
AD-A078421 ..... N80-19278 #
AD-A078430 ..... N80-19251 #
AD-A078436 ..... N80-19124 #
AD-A078438 ..... N80-19985 #
AD-A078439 ..... N80-19120 #
AD-A078440 ..... N80-19119 #
AD-A078441 ..... N80-19442 #
AD-A078470 ..... N80-19986 #
AD-A078471 ..... N80-19333 #
AD-A078476 ..... N80-19067 #
AD-A078477 ..... N80-19340 #
AD-A078482 ..... N80-19893 #
AD-A078483 ..... N80-19517 #
AD-A078484 ..... N80-19458 #
AD-A078485 ..... N80-19487 #
AD-A078512 ..... N80-19210 #
AD-A078516 ..... N80-19472 #
AD-A078522 ..... N80-19441 #
AD-A078527 ..... N80-19985 #
AD-A078529 ..... N80-19123 #
AD-A078588 ..... N80-19045 #
AD-A078590 ..... N80-19719 #
AD-A078592 ..... N80-19245 #
AD-A078594 ..... N80-19651 #
AD-A078596 ..... N80-19243 #
AD-A078597 ..... N80-19900 #
AD-A078603 ..... N80-19496 #
AD-A078606 ..... N80-19027 #
AD-A078616 ..... N80-19282 #
AD-A078624 ..... N80-19739 #
AD-A078627 ..... N80-19440 #
AD-A078629 ..... N80-19125 #
AD-A078653 ..... N80-19640 #
AD-A078660 ..... N80-19706 #
AD-A078664 ..... N80-19805 #
AD-A078665 ..... N80-19287 #
AD-A078668 ..... N80-19968 #
AD-A078669 ..... N80-19119 #
AD-A078670 ..... N80-19117 #
AD-A078672 ..... N80-19088 #
AD-A078673 ..... N80-19082 #
AD-A078675 ..... N80-19176 #
AD-A078680 ..... N80-19852 #
AD-A078681 ..... N80-19286 #
AD-A078705 ..... N80-19276 #
AD-A078706 ..... N80-19879 #
AD-A078718 ..... N80-19329 #
AD-A078720 ..... N80-19336 #
AD-A078721 ..... N80-19219 #
AD-A078727 ..... N80-19175 #
AD-A078735 ..... N80-19505 #
AD-A078743 ..... N80-19597 #
AD-A078750 ..... N80-19331 #
AD-A078751 ..... N80-19890 #
AD-A078755 ..... N80-19279 #
AD-A078797 ..... N80-19473 #
AD-A078802 ..... N80-19083 #
AD-A078812 ..... N80-19248 #
AD-A078825 ..... N80-19048 #
AD-A078831 ..... N80-19301 #
AD-A078833 ..... N80-19241 #
AD-A078840 ..... N80-19432 #
AD-A078841 ..... N80-19873 #
AD-A078842 ..... N80-19143 #
AD-A078843 ..... N80-19052 #
AD-A078845 ..... N80-19290 #
AD-A078847 ..... N80-19439 #
AD-A078858 ..... N80-19714 #
AD-A078860 ..... N80-19437 #
AD-A078861 ..... N80-19044 #
AD-A078864 ..... N80-19431 #
AD-A078865 ..... N80-19443 #
AD-A078908 ..... N80-19218 #
AD-A078909 ..... N80-19042 #
AD-A078917 ..... N80-19459 #
AD-A078919 ..... N80-19485 #
AD-A078934 ..... N80-19509 #
AD-A078951 ..... N80-19249 #
AD-A078952 ..... N80-19480 #
AD-A078958 ..... N80-19114 #
AD-A078959 ..... N80-19436 #
AD-A078973 ..... N80-20020 #
AD-A078980 ..... N80-19738 #
AD-A079008 ..... N80-19075 #
AD-A079115 ..... N80-19074 #
AD-A079295 ..... N80-19737 #
AD-A079297 ..... N80-19952 #
AD-A079369 ..... N80-19086 #
AD-A079495 ..... N80-19130 #
AD-A079700 ..... N80-19789 #
AD-A079704 ..... N80-19907 #
AD-A079722 ..... N80-19906 #
AD-A079748 ..... N80-19079 #
AD-A079803 ..... N80-19076 #
AD-A079851 ..... N80-19078 #
AD-A079852 ..... N80-19077 #
AD-A079911 ..... N80-19085 #
AD-A079923 ..... N80-19081 #
AD-A079924 ..... N80-19072 #
AD-A079990 ..... N80-19726 #
AD-A079991 ..... N80-19727 #
AD-A079992 ..... N80-19728 #
AD-A079993 ..... N80-19729 #
AD-A079995 ..... N80-19732 #
AD-A079996 ..... N80-19227 #
AD-A079997 ..... N80-19228 #
AD-A079998 ..... N80-19730 #
AD-A079999 ..... N80-19731 #
AD-A080000 ..... N80-19733 #
AD-A080001 ..... N80-19073 #
AD-A080025 ..... N80-19902 #
AD-A080034 ..... N80-19106 #
AD-A080047 ..... N80-19734 #
AD-A080082 ..... N80-19903 #
AD-A080082 ..... N80-19277 #
AD-E000335 ..... N80-19716 #
AD-E200400 ..... N80-19474 #
AD-E300614 ..... N80-19721 #
AD-E400339 ..... N80-19006 #
AD-E430301 ..... N80-19285 #
AD-E430304 ..... N80-19699 #
AD-E430307 ..... N80-19455 #
AD-E430330 ..... N80-20000 #
AD-E430336 ..... N80-19188 #
AEDC-TR-79-29-VOL-1 ..... N80-19187 #
AEDC-TR-79-29-VOL-2 ..... N80-19134 #
AEDC-TR-79-55 ..... N80-19191 #
AEDC-TR-79-60 ..... N80-19135 #
AEDC-TR-7988 ..... N80-19040 #
AEDC-TSR-79-P27 ..... N80-19800 #
AFAL-TR-79-1171 ..... N80-19088 #
AFAL-TR-79-2086 ..... N80-19119 #
AFAPL-TR-79-2015 ..... N80-19429 #
AFAPL-TR-79-2029 ..... N80-19117 #
AFAPL-TR-79-2043 ..... N80-19443 #
AFAPL-TR-79-2045 ..... N80-19120 #
AFAPL-TR-79-2054 ..... N80-19109 #
AFAPL-TR-79-2060 ..... N80-19116 #
AFAPL-TR-79-2061 ..... N80-19118 #
AFAPL-TR-79-2074 ..... N80-19115 #
AFAPL-TR-79-2083 ..... N80-19125 #
AFAPL-TR-79-2084 ..... N80-19079 #
AFAPL-TR-79-2104 ..... N80-19636 #
AFESC/ESL-TR-79-21-VOL-1 ..... N80-19288 #
AFFDL-TR-77-107 ..... N80-19128 #
AFFDL-TR-78-154 ..... N80-20020 #
AFFDL-TR-78-181 ..... N80-19068 #
AFFDL-TR-78-203 ..... N80-19567 #
AFFDL-TR-78-208-VOL-1 ..... N80-19041 #
AFFDL-TR-79-3007 ..... N80-19085 #
AFFDL-TR-79-3021-REV-A ..... N80-19084 #
AFFDL-TR-79-3037 ..... N80-19082 #
AFFDL-TR-79-3058 ..... N80-19081 #
AFFDL-TR-79-3058-VOL-2 ..... N80-19044 #
AFFDL-TR-79-3065 ..... N80-19066 #
AFFDL-TR-79-3069-VOL-1 ..... N80-19136 #
AFFDL-TR-79-3071 ..... N80-19107 #
AFFDL-TR-79-3075 ..... N80-19075 #
AFFDL-TR-79-3102 ..... N80-19076 #
AFFDL-TR-79-3105-VOL-2-PT-2 ..... N80-19043 #
AFFDL-TR-79-3109 ..... N80-19505 #
AFFDL-TR-79-3112 ..... N80-20020 #
AFFDL-TR-79-3133 ..... N80-19689 #
AFG-TR-79-0044 ..... N80-19725 #
AFGL-AFSG-408 ..... N80-19741 #
AFGL-AFSG-414-PT-5 ..... N80-19174 #
AFGL-ERP-667 ..... N80-19706 #
AFGL-IP-276 ..... N80-19710 #
AFGL-TR-78-0260 ..... N80-19691 #
AFGL-TR-79-0023 ..... N80-19725 #
AFGL-TR-79-0079 ..... N80-19874 #
AFGL-TR-79-0132 ..... N80-19706 #
AFGL-TR-79-0137 ..... N80-19735 #
AFGL-TR-79-0140 ..... N80-19950 #
AFGL-TR-79-0144 ..... N80-19174 #
AFGL-TR-79-0153 ..... N80-19741 #
AFGL-TR-79-0155-PT-5 ..... N80-19698 #
AFGL-TR-79-0164 ..... N80-19690 #
AFGL-TR-79-0165 ..... N80-19038 #
AFGL-TR-79-0166 ..... N80-19037 #
AFGL-TR-79-0175 ..... N80-19722 #
AFGL-TR-79-0180 ..... N80-19717 #
AFGL-TR-79-0219 ..... N80-19709 #
AFGL-TR-79-0220 ..... N80-19707 #
AFGL-TR-79-0221 ..... N80-19473 #
AFGL-TR-79-0226 ..... N80-19472 #
AFGL-TR-79-0229 ..... N80-19945 #
AFGL-TR-79-0243 ..... N80-19718 #
AFGL-TR-79-0247 ..... N80-19518 #
AFIT-LSSR-23-79B ..... N80-19122 #
AFIT-LSSR-27-79B ..... N80-19078 #
AFIT/GAE/AA/79D-6 ..... N80-19077 #
AFIT/GAE/AA/79D-9 ..... N80-19287 #
AFLRL-94 ..... N80-19239 #
AFML-TR-78-41 ..... N80-19121 #
AFML-TR-79-4032 ..... N80-19208 #
AFML-TR-79-4040

AFML-TR-79-4048 ..... N80-19589 #
AFML-TR-79-4095 ..... N80-19948 #
AFML-TR-79-4089 ..... N80-19211 #
AFML-TR-79-4092 ..... N80-19249 #
AFML-TR-79-4100 ..... N80-19290 #
AFML-TR-79-4116 ..... N80-19250 #
AFML-TR-79-4117 ..... N80-19242 #
AFML-TR-79-4124 ..... N80-19988 #
AFML-TR-79-4125 ..... N80-19428 #
AFML-TR-79-4132 ..... N80-19240 #
AFML-TR-79-4133 ..... N80-19244 #
AFML-TR-79-4138 ..... N80-19238 #

AFOSR-79-0808TR ..... N80-19917 #
AFOSR-79-0976TR ..... N80-19889 #
AFOSR-79-1036TR ..... N80-19920 #
AFOSR-79-1038TR ..... N80-19926 #
AFOSR-79-1062TR ..... N80-19291 #
AFOSR-79-1095TR ..... N80-19876 #
AFOSR-79-1097TR ..... N80-19921 #
AFOSR-79-1124TR ..... N80-19949 #
AFOSR-79-1139TR ..... N80-19253 #
AFOSR-79-1142TR ..... N80-19875 #
AFOSR-79-1154TR ..... N80-19850 #
AFOSR-79-1155TR ..... N80-19289 #
AFOSR-79-1159TR ..... N80-19886 #
AFOSR-79-1160TR ..... N80-19672 #
AFOSR-79-1164TR ..... N80-19677 #
AFOSR-79-1171TR ..... N80-19889 #
AFOSR-79-1175TR ..... N80-19051 #
AFOSR-79-1186TR ..... N80-19919 #
AFOSR-79-1212TR ..... N80-19900 #
AFOSR-79-1226TR ..... N80-19896 #
AFOSR-79-1227TR ..... N80-19870 #
AFOSR-79-1232TR ..... N80-19220 #
AFOSR-79-1234TR ..... N80-19487 #
AFOSR-79-1235TR ..... N80-19694 #
AFOSR-79-1236TR ..... N80-19502 #
AFOSR-79-1242TR ..... N80-19223 #
AFOSR-79-1259TR ..... N80-19516 #
AFOSR-79-1261TR ..... N80-19517 #
AFOSR-79-1262TR ..... N80-19224 #
AFOSR-79-1263TR ..... N80-19480 #
AFOSR-79-1268TR ..... N80-19438 #
AFOSR-79-1272TR ..... N80-19852 #
AFOSR-79-1274TR ..... N80-19917 #
AFOSR-79-1278TR ..... N80-19885 #
AFOSR-79-1284TR ..... N80-19890 #
AFOSR-79-1286TR ..... N80-19290 #
AFOSR-80-0014TR ..... N80-19903 #
AFOSR-80-0080TR ..... N80-19902 #

AFRPL-TR-79-91-VOL-1 ..... N80-19227 #

AFWL-TR-78-92 ..... N80-19430 #
AFWL-TR-79-52 ..... N80-19485 #
AFWL-TR-79-108 ..... N80-19716 #

AGARD-AG-240 ..... N80-19137 #

AGARD-AR-132-VOL-2 ..... N80-19047 #

AGARD-CP-261 ..... N80-19519 #
AGARD-CP-263 ..... N80-19372 #
AGARD-CP-268 ..... N80-19809 #
AGARD-CP-269 ..... N80-19345 #
AGARD-CP-277 ..... N80-19572 #

AGARD-LS-104 ..... N80-19094 #

AGARD-R-682 ..... N80-19090 #

AI-M-435 ..... N80-19891 #
AI-M-465 ..... N80-19508 #
AI-M-506 ..... N80-19886 #
AI-M-510 ..... N80-19927 #
AI-M-517 ..... N80-19946 #
AI-M-518 ..... N80-19941 #
AI-M-520 ..... N80-19793 #
AI-M-526 ..... N80-19965 #
AI-M-539 ..... N80-19470 #
AI-M-544 ..... N80-19804 #

AI-TR-503 ..... N80-19864 #

AIRESEARCH-41-2226 ..... N80-19123 #

AMA-79-15 ..... N80-19055* #

AMMRC-TR-79-39 ..... N80-19245 #

AMMRC-TR-79-48 ..... N80-19509 #
AMMRC-TR-79-49 ..... N80-19329 #
AMMRC-TR-79-50 ..... N80-19080 #

AMRL-TR-79-47 ..... N80-19788 #
AMRL-TR-79-67 ..... N80-19086 #
AMRL-TR-79-101 ..... N80-19951 #

ANL/EES/TM-58 ..... N80-19668 #

APL/JHU-TG-1320 ..... N80-19143 #

AR-001-906 ..... N80-19032 #

ARBRL-CR-00404 ..... N80-19295 #

ARBRL-TR-02179 ..... N80-19038 #
ARBRL-TR-02182 ..... N80-19899 #
ARBRL-TR-02193 ..... N80-19455 #
ARBRL-TR-02195 ..... N80-20000 #

ARC-TN-1089 ..... N80-19321* #

ARI-AR-171 ..... N80-19688 #

ARI-RM-78-5 ..... N80-19803 #

ARI-TR-78-87 ..... N80-19979 #

ARO-13249.1-C ..... N80-19286 #
ARO-13520.6-GSX ..... N80-19737 #
ARO-13520.7-ASX ..... N80-19738 #
ARO-13535.2-GS ..... N80-19719 #
ARO-13677.1-ELX ..... N80-19343 #
ARO-13735.4-ELX ..... N80-19336 #
ARO-13960.4-CX ..... N80-19298 #
ARO-14057.4-MS ..... N80-19248 #
ARO-14086.4-C ..... N80-19219 #
ARO-14104.5-PX ..... N80-19222 #
ARO-14245.5-M ..... N80-19507 #
ARO-14277.1-E ..... N80-19039 #
ARO-14369.3-E ..... N80-19457 #
ARO-16054.2-A-P ..... N80-19952 #
ARO-16222.2-EL ..... N80-19873 #

ARSCD-CR-79007-PT-5 ..... N80-19721 #

ASD-TR-79-5037 ..... N80-19670 #

AVRADCOM-TR-80-B-2 ..... N80-19033* #
AVRADCOM-TR-80-C-5 ..... N80-19498* #

AWS-TR-79-003-PT-4 ..... N80-19712 #
AWS-TR-79-004 ..... N80-19714 #

BBC-RD-1979/26 ..... N80-19485
BBC-RD-1979/27 ..... N80-19317
BBC-RD-1979/29 ..... N80-19928

BC-SDAL-79-1 ..... N80-19874 #

BDX-613-2303 ..... N80-19258 #
BDX-613-2304 ..... N80-19445 #

BER-249-25 ..... N80-19426* #

BERC/RI-79/4 ..... N80-19296 #

BLL-RTS-11579 ..... N80-19487
BLL-RTS-11591 ..... N80-19234
BLL-RTS-11695 ..... N80-19235
BLL-RTS-11801 ..... N80-19423
BLL-RTS-11804 ..... N80-19216
BLL-RTS-11805 ..... N80-19282
BLL-RTS-11808 ..... N80-19514
BLL-RTS-11856 ..... N80-19312
BLL-RTS-11884 ..... N80-19420
BLL-RTS-11885 ..... N80-19421
BLL-RTS-11902 ..... N80-19494
BLL-RTS-11914 ..... N80-19318
BLL-RTS-11924 ..... N80-19261
BLL-RTS-11943 ..... N80-19466

BLL-TRANS-1397-(9022.549) N80-19680
BLL-TRANS-1400-(9022.549) N80-19700
BLL-TRANS-1402-(9022.549) N80-19681
BLL-TRANS-1407-(9022.549) N80-19701
BLL-TRANS-1421-(9022.549) N80-19702

BLL-TRS-11923 ..... N80-19233

BMPA-2 ..... N80-19433 #

BMR-2 ..... N80-19179* #

BN-913 ..... N80-19911 #

BNL-26721 ..... N80-19294 #
BNL-26765 ..... N80-19930 #
BNL-29904 ..... N80-19854 #

BR71984 ..... N80-19285 #
BR71985 ..... N80-19112 #

C-536-3 ..... N80-19825 #

CALSPAN-XE-5933-A-103 ..... N80-19116 #
CALSPAN-XE-5933-A-104 ..... N80-19109 #
CALSPAN-XE-5933-A-105 ..... N80-19115 #

CED-80-5 ..... N80-19742 #

CEEDO-TR-79-06 ..... N80-19119 #

CEL-TN-1558 ..... N80-19640 #

CERC-TR-79-1 ..... N80-19342 #

CNES-NT-81 ..... N80-19320* #

CONF-790150-6 ..... N80-19938 #
CONF-790242-1 ..... N80-19931 #
CONF-790726-4 ..... N80-19973 #
CONF-790773-1 ..... N80-19255 #
CONF-790917-11 ..... N80-19294 #
CONF-790976-1 ..... N80-19488 #
CONF-790988-1 ..... N80-19924 #
CONF-791017-10 ..... N80-19643 #
CONF-791102-3 ..... N80-19446 #
CONF-791109-1 ..... N80-19961 #
CONF-791127-4 ..... N80-19654 #
CONF-7908119-1 ..... N80-19697 #

CONS-3205-T2 ..... N80-19213 #

COO-1340-65 ..... N80-19644 #
COO-3416-13 ..... N80-19229 #
COO-4094-59 ..... N80-19649 #
COO-4987-1 ..... N80-19974 #

CRIF-PL-4 ..... N80-19207* #

CRPLI-78-9-PT-1 ..... N80-19056 #
CRPLI-78-9-PT-2 ..... N80-19058 #
CRPLI-78-9-PT-3 ..... N80-19058 #

CRREL-SR-79-35 ..... N80-19587 #

CSC-TR-741 ..... N80-19892 #
CSC-TR-790 ..... N80-19866 #

CST-74 ..... N80-19421

CU-CS-154-79 ..... N80-19581 #

CUED/A-TURBO/TR-98 ..... N80-19029 #

C79-85/201 ..... N80-19429 #
C79-951/201 ..... N80-19435 #

DCW-R-24-01 ..... N80-19448* #

DELET-TR-77-2704-F ..... N80-19431 #
DELET-TR-78-0584-3 ..... N80-19835 #
DELET-TR-78-2935-1 ..... N80-19851 #
DELET-TR-78-2961-1 ..... N80-19436 #

DELNV-TR-79-5 ..... N80-19486 #

DNA-4768F ..... N80-19474 #

DOE/ER-01368-775 ..... N80-19931 #
DOE/ER-01368-777 ..... N80-19938 #

DOE/ET-2304-1 ..... N80-19652 #
DOE/ET-23005-T2 ..... N80-19653 #
DOE/ET-28432-1 ..... N80-19604 #
DOE/ET-28432-2 ..... N80-19605 #
DOE/ET-28432-3/1 ..... N80-19606 #
DOE/ET-28432-3/2 ..... N80-19607 #

DOE/EV-0050/1 — N80-19510 #

DOE/ID-01796-1 — N80-19650 #
DOE/ID-01822-1 — N80-19651 #

DOE/JPL-1012-39 — N80-19611* #
DOE/JPL-1012-40 — N80-19633* #
DOE/JPL-1080-17-REV-1 — N80-19634* #
DOE/JPL-954374-79/10 — N80-19623* #
DOE/JPL-954895-80/6 — N80-19617* #
DOE/JPL-955164-79/4 — N80-19619* #
DOE/JPL-955286-79/2 — N80-19618* #
DOE/JPL-955316-79/3 — N80-19620* #

DOE/NASA/0063-79/1 — N80-19612* #
DOE/NASA/1010-80/6 — N80-19614* #
DOE/NASA/1028-80/26 — N80-19613* #
DOE/NASA/1062-80/4 — N80-19626* #

DOE/SF-01525-1 — N80-19642 #

DOT-HS-809025 — N80-19992 #
DOT-HS-805078 — N80-19991 #

DP-MS-79-57 — N80-19255 #

DP-1534 — N80-19478 #

DTNSRDC-79/019 — N80-19456 #
DTNSRDC-79/095 — N80-19506 #
DTNSRDC-79/092 — N80-19434 #

DTNSRDC/ASED-79/08 — N80-19046 #

DTNSRDC/SPD-0795-01 — N80-19723 #

DS-1169-1 — N80-19586* #
D6-32972 — N80-19791* #
D180-20545-2A — N80-19206* #
D180-25481-1-VOL-1-REV-A — N80-19631* #
D180-25481-3 — N80-19616* #

E-083 — N80-19496* #
E-124 — N80-19495* #
E-312 — N80-19626* #
E-329 — N80-19283* #
E-351 — N80-19110* #
E-353 — N80-19497* #
E-364 — N80-19614* #
E-365 — N80-19613* #
E-366 — N80-19498* #
E-384 — N80-19993* #

EC/2107401-TR-1-VOL-1 — N80-19944 #

EGG-GTH-5004 — N80-19602 #

EPA-450/4-79-005 — N80-19573 #
EPA-450/4-79-012 — N80-19576 #
EPA-450/5-79-006 — N80-19577 #
EPA-600/2-79-076 — N80-19983 #
EPA-600/2-79-120 — N80-19570 #
EPA-600/2-79-168 — N80-19869 #
EPA-600/3-79-103 — N80-19579 #
EPA-600/7-79-082B — N80-19655 #
EPA-600/7-79-168 — N80-19578 #
EPA-600/7-79-179 — N80-19572 #
EPA-600/7-79-184 — N80-19310 #
EPA-600/7-79-186 — N80-19574 #
EPA-600/7-79-189 — N80-19571 #
EPA-600/7-79-201 — N80-19309 #

EPRI-AF-1160 — N80-19648 #

EPRI-EA-1131-APP-B — N80-19987 #

EPRI-EL-1150-VOL-1 — N80-19855 #
EPRI-EL-1150-VOL-2 — N80-19856 #
EPRI-EL-1150-VOL-3 — N80-19857 #

ERADCOM/ASL-CR-79-0100-5 — N80-19886 #

ERADCOM/ASL-OR-1052 — N80-19732 #
ERADCOM/ASL-OR-1053 — N80-19730 #
ERADCOM/ASL-OR-1054 — N80-19729 #
ERADCOM/ASL-OR-1055 — N80-19728 #
ERADCOM/ASL-OR-1057 — N80-19726 #
ERADCOM/ASL-OR-1058 — N80-19734 #
ERADCOM/ASL-OR-1061 — N80-19727 #
ERADCOM/ASL-OR-1065 — N80-19731 #

ERADCOM/ASL-OR-1067 — N80-19733 #

ERADCOM/ASL-TR-0042 — N80-19713 #

ERIM-122000-14-F — N80-19236 #
ERIM-132300-3-T — N80-19590 #
ERIM-139800-3-F — N80-19596 #

ERT-P-3489 — N80-19595 #
ERT-P-5287-800 — N80-19675 #

ESD-TR-79-36 — N80-19327 #
ESD-TR-79-128 — N80-19324 #
ESD-TR-79-179 — N80-19870 #
ESD-TR-79-195 — N80-20021 #
ESD-TR-79-215 — N80-19177 #
ESD-TR-79-261 — N80-19176 #

ESDU-79002 — N80-19493
ESDU-79015 — N80-19028
ESDU-79024 — N80-19060

ESL-7119947-4 — N80-19331 #
ESL-7845S8-20 — N80-19330 #

ETL-0172 — N80-19601 #
ETL-0191 — N80-19471* #
ETL-0196 — N80-19476 #
ETL-0206 — N80-19333 #

E80-10057 — N80-19585* #
E80-10077 — N80-19586* #
E80-10078 — N80-19587* #
E80-10080 — N80-19588* #
E80-10081 — N80-19589* #
E80-10082 — N80-19590* #
E80-10083 — N80-19591* #
E80-10085 — N80-19592* #
E80-10086 — N80-19593* #

FAA-RD-78-154-VOL-2 — N80-19130 #
FAA-RD-79-94 — N80-19319 #
FAA-RD-79-99 — N80-19054 #

FCR-1857 — N80-19615* #

FE-2029-15 — N80-19292 #
FE-2275-11 — N80-19307 #
FE-2361-40 — N80-19306 #
FE-2422-39 — N80-19304 #
FE-2433-25-VOL-1 — N80-19305 #
FE-2449-9 — N80-19298 #
FE-2516-9 — N80-19293 #
FE-2666-T1 — N80-19303 #
FE-3177-4 — N80-19302 #
FE-257709 — N80-19308 #

FHWA/CA/TL-79-14 — N80-19315 #

FHWA/IL/UI-179 — N80-19314 #

FHWA/VA-79-R54 — N80-19743 #

FR-79-4 — N80-19476 #
FR-10961 — N80-19121 #

FSU-STATISTICS-M521 — N80-19736 #

FZM-6809-VOL-1 — N80-19567 #

GA-A-15442 — N80-19462 #

GDC-CRAD-80-003 — N80-19185* #

GERA-2378 — N80-19080 #

GE78TMP-102 — N80-19474 #

GJBX-171(79) — N80-19603 #

GPO-56-220 — N80-19988 #

GRC-TM-2270 — N80-19875 #

HDL-CR-79-029-1 — N80-19180 #

HDL-TM-79-22 — N80-19275 #
HDL-TM-79-29 — N80-19440 #

HEDL-SA-1826-FP — N80-19924 #

HEL-TM-13-79 — N80-19089 #
HEL-TM-17-79 — N80-19805 #

HONEYWELL-1079-19060 — N80-19951 #

IAC-REF-77-15/1 — N80-19471* #

IAC-TM-5788 — N80-19471* #

IB4577 — N80-19705* #

ICHRP-179 — N80-19314 #

INPE-1588-RPE/070-VOL-2 — N80-19745 #

IR-1 — N80-19851 #
IR-432 — N80-19881* #

ISBN-0-85679-260-8 — N80-19028
ISBN-0-85679-272-1 — N80-19060
ISBN-92-835-0244-2 — N80-19572 #
ISBN-92-835-0253-1 — N80-19372 #
ISBN-92-835-0254-X — N80-19519 #
ISBN-92-835-0255-8 — N80-19809 #
ISBN-92-835-1340-1 — N80-19094 #
ISBN-92-835-1342-8 — N80-19390 #
ISBN-92-835-1343-6 — N80-19137 #
ISBN-92-835-1344-4 — N80-19047 #
ISBN-92-835-1345-2 — N80-19345 #

ISI/RR-79-78 — N80-19867 #

ISSN-0141-391-397X — N80-19028
ISSN-0141-2590 — N80-19493
ISSN-0141-3066 — N80-19060
ISSN-0141-3996 — N80-19493
ISSN-0309-8521 — N80-19029 #
ISSN-0547-1567 — N80-19953 #

ITR-1 — N80-19436 #

JPL-PUB-79-39-REV-1 — N80-19634* #
JPL-PUB-79-57 — N80-19990 #
JPL-PUB-79-67 — N80-19989* #
JPL-PUB-79-108 — N80-19499* #
JPL-PUB-79-109 — N80-19996* #
JPL-PUB-79-112-VOL-1 — N80-19632* #
JPL-PUB-80-1 — N80-19983* #
JPL-PUB-80-5 — N80-19611* #
JPL-PUB-80-7 — N80-19323* #
JPL-PUB-80-12 — N80-19633* #
JPL-PUB-80-14 — N80-19183* #

JPL-9950-26 — N80-19625* #
JPL-9950-272 — N80-19623* #
JPL-9950-273 — N80-19622* #
JPL-9950-279 — N80-19624* #
JPL-9950-283 — N80-19621* #
JPL-9950-287 — N80-19619* #
JPL-9950-288 — N80-19620* #

JPRS-75251 — N80-19755 #

JSC-14634-VOL-1 — N80-19586* #
JSC-16073 — N80-19184* #
JSC-16255 — N80-19610* #
JSC-16298 — N80-19587* #
JSC-16366 — N80-19178* #
JSC-16427 — N80-19515* #

JSR-79-07D — N80-19740 #

L-12804 — N80-19142* #
L-13279 — N80-19563* #
L-13353 — N80-19031* #
L-13364 — N80-19131* #
L-13371 — N80-19023* #
L-13488 — N80-19145* #
L-13503 — N80-19193* #

LA-7819 — N80-19463 #
LA-7844-PR — N80-19854 #
LA-7921-PR — N80-19937 #
LA-7937-PR — N80-19299 #
LA-7995-TASE — N80-19848 #
LA-8064-MS — N80-19960 #

LBL-8185 — N80-19992 #
LBL-9276 — N80-19230 #
LBL-9429 — N80-19972 #

LBL-8482 N80-19971 #
LBL-8640 N80-19212 #
LBL-8687 N80-19214 #

LEC-12904-VOL-1 N80-19586* #

LEMSCO-14077 N80-19587* #

LG78ER0223-VOL-2 N80-19091 #

LIDS-P-985 N80-19902 #

LMSC-D678883 N80-19687 #
LMSC-D683306 N80-19896 #
LMSC-D683307 N80-19670 #

LRDC-1979/9 N80-19904 #

LSI-TR-353-4 N80-19800* #

LTR-141-122 N80-19477 #

M-257 N80-19173* #
M-298 N80-19704* #

MAE-1373 N80-19301 #

MAGI-7065 N80-19333 #

MCA-WP13-01 N80-19443 #

MDC-G8456 N80-19144* #

MDC-J6065A N80-19298 #
MDC-J7186 N80-19082 #

MED113 N80-19284* #

MIMEO-SER-1220 N80-19920 #
MIMEO-SER-1242 N80-19922 #
MIMEO-SER-1244 N80-19921 #
MIMEO-SER-1255 N80-19919 #

MISD-UM-78-9 N80-19678 #

MIT/LCS/TM-132 N80-19226 #

MIT/LCS/TR-210 N80-19984 #

MPI-PAE/EXTRATERR-146 N80-19994* #

MRC-TSR-1995 N80-19987 #
MRC-TSR-2016 N80-19906 #

MRL-TN-420 N80-19481 #

MTR-3664 N80-19324 #

NADC-76097-30-VOL-1 N80-19073 #
NADC-76097-30-VOL-2 N80-19081 #
NADC-76097-30-VOL-3 N80-19072 #
NADC-77052-30 N80-19085 #
NADC-77136-60 N80-19123 #
NADC-77202-30 N80-19504 #
NADC-77336-60 N80-19435 #
NADC-78094-60 N80-19062 #
NADC-78111-40 N80-19432 #
NADC-79201-60 N80-19053 #
NADC-79240-60 N80-19049 #

NAL-TR-533 N80-19111* #

NAMRL-MONOGRAPH-24 N80-19769 #

NAMRL-SR-78-6 N80-19105 #

NAPC-PE-28 N80-19278 #

NASA-CASE-FRC-10112-1 N80-19469* #

NASA-CASE-GSC-12518-1 N80-19424* #

NASA-CASE-LAR-12308-1 N80-19664* #

NASA-CASE-LEW-12296-1 N80-19425* #

NASA-CASE-MSC-18172-1 N80-19237* #
NASA-CASE-MSC-18526-1 N80-19468* #

NASA-CP-2102 N80-20003* #

NASA-CR-2118 N80-19145* #
NASA-CR-2119 N80-19193* #

NASA-CR-2985 N80-19083* #
NASA-CR-3100 N80-19030* #
NASA-CR-3190 N80-19236* #
NASA-CR-3199 N80-19791* #
NASA-CR-3202 N80-19283* #
NASA-CR-3230 N80-19108* #
NASA-CR-3255 N80-19703* #
NASA-CR-3256 N80-19704* #
NASA-CR-3258 N80-19035* #
NASA-CR-150554 N80-20002* #
NASA-CR-152333 N80-19890* #
NASA-CR-152395 N80-19055* #
NASA-CR-152347 N80-19448* #
NASA-CR-159032 N80-19048* #
NASA-CR-159155 N80-19586* #
NASA-CR-159182 N80-19206* #
NASA-CR-159187 N80-19802* #
NASA-CR-159203 N80-19962* #
NASA-CR-159591 N80-19612* #
NASA-CR-159659 N80-19185* #
NASA-CR-159714 N80-19113* #
NASA-CR-159715 N80-19632* #
NASA-CR-159777 N80-19450* #
NASA-CR-159807 N80-19615* #
NASA-CR-160412 N80-19663* #
NASA-CR-160480 N80-19587* #
NASA-CR-160481 N80-19588* #
NASA-CR-160490 N80-19616* #
NASA-CR-160540 N80-19631* #
NASA-CR-160555 N80-19782* #
NASA-CR-160556 N80-19427* #
NASA-CR-160557 N80-19322* #
NASA-CR-160598 N80-19144* #
NASA-CR-161354 N80-19629* #
NASA-CR-161355 N80-19630* #
NASA-CR-161379 N80-19627* #
NASA-CR-161380 N80-19629* #
NASA-CR-161387 N80-19426* #
NASA-CR-161389 N80-19179* #
NASA-CR-161390 N80-19196* #
NASA-CR-161391 N80-19982* #
NASA-CR-161396 N80-19981* #
NASA-CR-161397 N80-19995* #
NASA-CR-161399 N80-19795* #
NASA-CR-161400 N80-19796* #
NASA-CR-161401 N80-19797* #
NASA-CR-161402 N80-19798* #
NASA-CR-161403 N80-19799* #
NASA-CR-161405 N80-20001* #
NASA-CR-161408 N80-19141* #
NASA-CR-161409 N80-19999* #
NASA-CR-161410 N80-19984* #
NASA-CR-162618 N80-19480* #
NASA-CR-162753 N80-19585* #
NASA-CR-162783 N80-19592* #
NASA-CR-162784 N80-19583* #
NASA-CR-162798 N80-19611* #
NASA-CR-162822 N80-19294* #
NASA-CR-162823 N80-19620* #
NASA-CR-162828 N80-19623* #
NASA-CR-162829 N80-19564* #
NASA-CR-162830 N80-19622* #
NASA-CR-162831 N80-19621* #
NASA-CR-162832 N80-19609* #
NASA-CR-162839 N80-19625* #
NASA-CR-162840 N80-19617* #
NASA-CR-162844 N80-19829* #
NASA-CR-162845 N80-19954* #
NASA-CR-162846 N80-19026* #
NASA-CR-162847 N80-19321* #
NASA-CR-162848 N80-19624* #
NASA-CR-162849 N80-19619* #
NASA-CR-162850 N80-19683* #
NASA-CR-162851 N80-19942* #
NASA-CR-162852 N80-19958* #
NASA-CR-162854 N80-19056* #
NASA-CR-162855 N80-19454* #
NASA-CR-162877 N80-19996* #
NASA-CR-162878 N80-19183* #
NASA-CR-162880 N80-19983* #
NASA-CR-162881 N80-19486* #
NASA-CR-162882 N80-19323* #
NASA-CR-162883 N80-19618* #
NASA-CR-162884 N80-19446* #
NASA-CR-162885 N80-19633* #
NASA-CR-162886 N80-19634* #

NASA-SP-7011(203) N80-19779*
NASA-SP-7011(204) N80-19781*
NASA-SP-7037(119) N80-19021*

NASA-TM-75429 N80-19601* #
NASA-TM-75511 N80-19320* #
NASA-TM-75515 N80-19451* #
NASA-TM-75703 N80-19936* #
NASA-TM-75718 N80-19111* #
NASA-TM-75719 N80-19257* #
NASA-TM-75728 N80-19787* #
NASA-TM-75756 N80-19565* #
NASA-TM-75768 N80-19133* #
NASA-TM-75771 N80-19447* #
NASA-TM-75779 N80-19705* #
NASA-TM-75806 N80-19453* #
NASA-TM-75811 N80-19994* #
NASA-TM-75823 N80-19452* #
NASA-TM-75869 N80-19750* #
NASA-TM-75870 N80-19783* #
NASA-TM-75887 N80-19751* #
NASA-TM-75889 N80-19784* #
NASA-TM-75896 N80-19785* #
NASA-TM-76036 N80-19786* #
NASA-TM-76058 N80-19752* #
NASA-TM-76059 N80-19753* #
NASA-TM-76071 N80-19754* #
NASA-TM-76072 N80-19748* #
NASA-TM-76235 N80-19173* #
NASA-TM-76296 N80-19264* #
NASA-TM-76298 N80-19217* #
NASA-TM-80186 N80-19033* #
NASA-TM-80203 N80-19023* #
NASA-TM-80204 N80-19024* #
NASA-TM-80222 N80-19132* #
NASA-TM-80244 N80-19589* #
NASA-TM-80582 N80-19591* #
NASA-TM-80602 N80-19588* #
NASA-TM-80667 N80-19590* #
NASA-TM-80756 N80-19749* #
NASA-TM-80759 N80-19997* #
NASA-TM-80760 N80-19982* #
NASA-TM-80958 N80-19610* #
NASA-TM-80961 N80-19184* #
NASA-TM-80962 N80-19515* #
NASA-TM-81002 N80-19471* #
NASA-TM-81146 N80-19127* #
NASA-TM-81170 N80-19025* #
NASA-TM-81176 N80-19792* #
NASA-TM-81400 N80-19626* #
NASA-TM-81413 N80-19263* #
NASA-TM-81427 N80-19496* #
NASA-TM-81429 N80-19110* #
NASA-TM-81430 N80-19497* #
NASA-TM-81444 N80-19614* #
NASA-TM-81445 N80-19613* #
NASA-TM-81446 N80-19498* #
NASA-TM-81453 N80-19963* #

NASA-TP-1512 N80-19128* #
NASA-TP-1558 N80-19963* #
NASA-TP-1606 N80-19142* #
NASA-TP-1619 N80-19031* #
NASA-TP-1631 N80-19131* #
NASA-TP-1648 N80-19495* #
NASA-TP-1650 N80-19022* #

NASA/TRW-79-2 N80-19048* #

NAVAIR-50-1C-534 N80-19708 #

NBS-TSR-9 N80-19243 #

NBSIR-79-1545 N80-19475 #
NBSIR-79-1904 N80-19243 #

NCSC-TM-271-79 N80-19838 #

NEPRF-CR-79-03 N80-19711 #
NEPRF-CR-79-05 N80-19595 #
NEPRF-CR-79-06 N80-19739 #

NEPRF-TR-79-06 N80-19720 #

NHB-5340.1B N80-19749* #

NLM/MED-79/06 N80-19987 #

NOSC/TD-269 N80-19344 #
NOSC/TD-282 N80-19898 #

NOSC/TR-328 ..... N80-19328 #
NOSC/TR-444 ..... N80-19341 #

NPS69-79-011 ..... N80-19325 #

NRL-MR-3693-REV ..... N80-19958* #
NRL-MR-4028 ..... N80-19957 #
NRL-MR-4033 ..... N80-19482 #
NRL-MR-4075 ..... N80-19257 #
NRL-MR-4076 ..... N80-19277 #
NRL-MR-4083 ..... N80-19956 #
NRL-MR-4089 ..... N80-19332* #
NRL-MR-4097 ..... N80-19281 #
NRL-MR-4111 ..... N80-19936 #
NRL-MR-4126 ..... N80-19889 #
NRL-MR-4129 ..... N80-19459 #

NSF/RA-790230 ..... N80-19908 #

NSSDC-79-09 ..... N80-19982* #

NSSDC/WDC-A-R&S-79-08-SUPPL-1 . N80-19997* #

NSWC/TR-79-41 ..... N80-19282 #
NSWC/TR-79-137 ..... N80-19439 #
NSWC/TR-79-153 ..... N80-19481 #
NSWC/TR-79-376 ..... N80-19190 #
NSWC/TR-3119 ..... N80-19671 #

NTIS/DF-78/001A ..... N80-19675 #

NTIS/PS-75/016 ..... N80-19490 #
NTIS/PS-75/025 ..... N80-19790 #
NTIS/PS-75/028 ..... N80-19912 #
NTIS/PS-75/033 ..... N80-19784 #
NTIS/PS-75/078 ..... N80-19744 #
NTIS/PS-75/094 ..... N80-19182 #
NTIS/PS-75/346 ..... N80-19658 #
NTIS/PS-75/590 ..... N80-19975 #
NTIS/PS-75/658 ..... N80-19490 #
NTIS/PS-75/691 ..... N80-19659 #
NTIS/PS-75/697 ..... N80-19259 #
NTIS/PS-75/722 ..... N80-19744 #
NTIS/PS-75/796 ..... N80-19258 #
NTIS/PS-75/794 ..... N80-19912 #
NTIS/PS-75/797 ..... N80-19507 #
NTIS/PS-75/802 ..... N80-19512 #
NTIS/PS-75/811 ..... N80-19958 #
NTIS/PS-75/855 ..... N80-19182 #
NTIS/PS-75/864 ..... N80-19884 #
NTIS/PS-75/876 ..... N80-19089 #
NTIS/PS-75/885 ..... N80-19790 #
NTIS/PS-76/0744 ..... N80-19975 #
NTIS/PS-76/0796 ..... N80-19659 #
NTIS/PS-76/0797 ..... N80-19657 #
NTIS/PS-76/0901 ..... N80-19981 #
NTIS/PS-76/0902 ..... N80-19982 #
NTIS/PS-76/0931 ..... N80-19744 #
NTIS/PS-76/0932 ..... N80-19912 #
NTIS/PS-76/0933 ..... N80-19490 #
NTIS/PS-76/0934 ..... N80-19491 #
NTIS/PS-76/0945 ..... N80-19507 #
NTIS/PS-76/0953 ..... N80-19512 #
NTIS/PS-76/0955 ..... N80-19511 #
NTIS/PS-76/0957 ..... N80-19259 #
NTIS/PS-76/0958 ..... N80-19260 #
NTIS/PS-76/0997 ..... N80-19958 #
NTIS/PS-76/0998 ..... N80-19960 #
NTIS/PS-76/0999 ..... N80-19790 #
NTIS/PS-76/1016 ..... N80-19258 #
NTIS/PS-76/1019 ..... N80-19257 #
NTIS/PS-76/1020 ..... N80-19182 #
NTIS/PS-76/1021 ..... N80-19181 #
NTIS/PS-76/1027 ..... N80-19884 #
NTIS/PS-76/1029 ..... N80-19985 #
NTIS/PS-76/1034 ..... N80-19089 #
NTIS/PS-76/1043 ..... N80-19794 #
NTIS/PS-77/0841 ..... N80-19975 #
NTIS/PS-77/0888 ..... N80-19659 #
NTIS/PS-77/0889 ..... N80-19657 #
NTIS/PS-77/1054 ..... N80-19807 #
NTIS/PS-77/1056 ..... N80-19981 #
NTIS/PS-77/1057 ..... N80-19982 #
NTIS/PS-77/1058 ..... N80-19912 #
NTIS/PS-77/1096 ..... N80-19259 #
NTIS/PS-77/1097 ..... N80-19260 #
NTIS/PS-77/1100 ..... N80-19958 #
NTIS/PS-77/1106 ..... N80-19744 #
NTIS/PS-77/1107 ..... N80-19490 #
NTIS/PS-77/1108 ..... N80-19491 #
NTIS/PS-77/1111 ..... N80-19960 #
NTIS/PS-77/1120 ..... N80-19182 #
NTIS/PS-77/1121 ..... N80-19181 #
NTIS/PS-77/1134 ..... N80-19512 #
NTIS/PS-77/1135 ..... N80-19511 #
NTIS/PS-77/1143 ..... N80-19089 #
NTIS/PS-77/1160 ..... N80-19794 #
NTIS/PS-77/1169 ..... N80-19884 #
NTIS/PS-77/1170 ..... N80-19985 #
NTIS/PS-77/1186 ..... N80-19258 #
NTIS/PS-77/1187 ..... N80-19257 #
NTIS/PS-77/1188 ..... N80-19790 #
NTIS/PS-78/1047 ..... N80-19975 #
NTIS/PS-78/1108 ..... N80-19659 #
NTIS/PS-78/1109 ..... N80-19657 #
NTIS/PS-78/1194 ..... N80-19912 #
NTIS/PS-78/1197 ..... N80-19807 #
NTIS/PS-78/1221 ..... N80-19958 #
NTIS/PS-78/1222 ..... N80-19960 #
NTIS/PS-78/1223 ..... N80-19981 #
NTIS/PS-78/1224 ..... N80-19982 #
NTIS/PS-78/1226 ..... N80-19744 #
NTIS/PS-78/1248 ..... N80-19089 #
NTIS/PS-78/1269 ..... N80-19182 #
NTIS/PS-78/1271 ..... N80-19181 #
NTIS/PS-78/1286 ..... N80-19512 #
NTIS/PS-78/1287 ..... N80-19511 #
NTIS/PS-78/1289 ..... N80-19794 #
NTIS/PS-78/1301 ..... N80-19790 #
NTIS/PS-78/1310 ..... N80-19259 #
NTIS/PS-78/1311 ..... N80-19260 #
NTIS/PS-78/1312 ..... N80-19884 #
NTIS/PS-78/1313 ..... N80-19985 #
NTIS/PS-78/1319 ..... N80-19490 #
NTIS/PS-78/1321 ..... N80-19491 #
NTIS/PS-78/1339 ..... N80-19258 #
NTIS/PS-78/1340 ..... N80-19257 #

NWC-TP-6133 ..... N80-19175 #

OCR-ONR-3 ..... N80-19251 #

ONR-CR-297-002-1 ..... N80-19458 #

ORAE-M87 ..... N80-19050 #

ORAU/IEA(R)-79-11 ..... N80-19647 #

ORNL/CSD-47 ..... N80-19910 #

ORNL/SUB-7644/10 ..... N80-19444 #

ORNL/TM-7112 ..... N80-19484 #

ORO-3443-84 ..... N80-19911 #
ORO-3992-367 ..... N80-19977 #
ORO-4043-39 ..... N80-19932 #

OSURF/780722/784741 ..... N80-19876 #

PATR-1065-79-7 ..... N80-19051 #

PA300-T-39-32 ..... N80-19035 #

PB-299050/5 ..... N80-19795* #
PB-299051/3 ..... N80-19796* #
PB-299052/1 ..... N80-19797* #
PB-299053/9 ..... N80-19798* #
PB-299054/7 ..... N80-19799* #

PB80-102759 ..... N80-19670 #
PB80-103674 ..... N80-20022 #
PB80-104606 ..... N80-19309 #
PB80-106366 ..... N80-19308 #
PB80-106511 ..... N80-19742 #
PB80-107055 ..... N80-19889 #
PB80-107154 ..... N80-19743 #
PB80-108145 ..... N80-19991 #
PB80-108566 ..... N80-19578 #
PB80-108947 ..... N80-19963 #
PB80-108954 ..... N80-19310 #
PB80-108962 ..... N80-19674 #
PB80-109085 ..... N80-19319 #
PB80-109184 ..... N80-19575 #
PB80-109968 ..... N80-19992 #
PB80-110422 ..... N80-19315 #
PB80-111099 ..... N80-19696 #
PB80-111818 ..... N80-19672 #
PB80-112345 ..... N80-19573 #
PB80-112366 ..... N80-19571 #
PB80-112591 ..... N80-19579 #
PB80-112999 ..... N80-19571 #
PB80-112907 ..... N80-19570 #
PB80-113574 ..... N80-19855 #
PB80-113798 ..... N80-19876 #
PB80-114531 ..... N80-19967 #
PB80-120082 ..... N80-19314 #
PB80-121221 ..... N80-19677 #
PB80-802093 ..... N80-19192 #
PB80-802101 ..... N80-19181 #
PB80-802119 ..... N80-19089 #
PB80-802218 ..... N80-19656 #
PB80-802333 ..... N80-19958 #
PB80-802341 ..... N80-19959 #
PB80-802358 ..... N80-19960 #
PB80-802580 ..... N80-19981 #
PB80-802596 ..... N80-19982 #
PB80-802622 ..... N80-19512 #
PB80-802630 ..... N80-19511 #
PB80-802655 ..... N80-19975 #
PB80-802663 ..... N80-19976 #
PB80-802796 ..... N80-19744 #
PB80-802978 ..... N80-19912 #
PB80-803000 ..... N80-19658 #
PB80-803018 ..... N80-19659 #
PB80-803026 ..... N80-19660 #
PB80-803034 ..... N80-19657 #
PB80-803075 ..... N80-19794 #
PB80-803117 ..... N80-19790 #
PB80-803133 ..... N80-19490 #
PB80-803141 ..... N80-19491 #
PB80-803166 ..... N80-19807 #
PB80-803190 ..... N80-19258 #
PB80-803208 ..... N80-19257 #
PB80-803216 ..... N80-19259 #
PB80-803224 ..... N80-19260 #
PB80-803281 ..... N80-19883 #
PB80-803299 ..... N80-19884 #
PB80-803307 ..... N80-19885 #

PGA-TR-79-1 ..... N80-19285 #

PNL-2950-PT-2-SUPPL ..... N80-19666 #
PNL-3036 ..... N80-19939 #

POLY-EE-79-058 ..... N80-19326 #

POLY-M/AE-79-40 ..... N80-19457 #

PR-2 ..... N80-19585* #
PR-313 ..... N80-19998* #
PR-346 ..... N80-19452* #

PREPRINT-79 ..... N80-19909 #

PS-00945 ..... N80-19038 #

PSI-TR-167 ..... N80-19300 #

PT-5289 ..... N80-19433 #

PTPT-79-2 ..... N80-19271 #

PWA-FR-11085 ..... N80-19120 #

PWA-5561-55 ..... N80-19113* #

PYU-6069 ..... N80-19290 #

QPR-3 ..... N80-19652 #
QPR-4 ..... N80-19141* #

QR-2 ..... N80-19943 #
QR-3 ..... N80-19635 #
QR-13 ..... N80-19292 #

QTPR-2 ..... N80-19653 #
QTPR-8 ..... N80-19303 #
QTPR-06 ..... N80-19308 #

QTR-8 ..... N80-19438 #

R-254U-VOL-2 ..... N80-19061 #
R-287U-VOL-3 ..... N80-19072 #
R-303U-VOL-1 ..... N80-19073 #
R-345 ..... N80-19571 #
R-346 ..... N80-19570 #

RADC-TR-79-135 ..... N80-19437 #
RADC-TR-79-177 ..... N80-19338 #

RADC-TR-79-197 ..... N80-19337 #
RADC-TR-79-207 ..... N80-19967 #
RADC-TR-79-221-VOL-1 ..... N80-19944 #
RADC-TR-79-222 ..... N80-19339 #
RADC-TR-79-241-VOL-1 ..... N80-19985 #
RADC-TR-79-257 ..... N80-19340 #
RADC-TR-79-21123 ..... N80-19949 #

RAE-LIB-TRANS-1918 ..... N80-19780
RAE-LIB-TRANS-2028 ..... N80-19112 #
RAE-LIB-TRANS-2029 ..... N80-19265 #

RAND/N-1247-AF ..... N80-19027 #
RAND/N-1311-AF ..... N80-19052 #

RAND/R-2249-AF ..... N80-19084 #

RE-587 ..... N80-19504 #

REPT-G302-80-001 ..... N80-19564* #

REPT-22 ..... N80-19133* #
REPT-79-FM-45 ..... N80-19610* #
REPT-79-2 ..... N80-19923 #
REPT-79-9D4-PULSE-R1 ..... N80-19501 #
REPT-80-FM-7 ..... N80-19178* #
REPT-094-009168 ..... N80-19436 #
REPT-1273-VOL-1 ..... N80-19073 #
REPT-1273-VOL-2 ..... N80-19061 #
REPT-1273-VOL-3 ..... N80-19072 #
REPT-1750-01-2-2041 ..... N80-19105 #
REPT-4078.4 ..... N80-19252 #
REPT-19303-653171 ..... N80-19315 #
REPT-33452-M2 ..... N80-19186* #
REPT-33574-M2 ..... N80-19179* #
REPT-711934-1 ..... N80-19683* #

RLO-1388-775 ..... N80-19931 #
RLO-1388-777 ..... N80-19938 #

RTS-11804 ..... N80-19218

R78AEG314 ..... N80-19124 #
R79-920003-F ..... N80-19045 #
R79AEG321 ..... N80-19119 #
R79AEG527 ..... N80-19118 #
R8001-2 ..... N80-19322* #
R8003-1 ..... N80-19427* #

SAI-171-80-573-LA ..... N80-19715 #
SAI-175-80-008-R ..... N80-19044 #

SAMSO-TR-79-74 ..... N80-19189 #

SAMTEC-TR-79-2 ..... N80-19335 #

SAN/115-136/2 ..... N80-19740 #
SAN/1894-1 ..... N80-19641 #

SAND-79-0114 ..... N80-19696 #
SAND-79-0449 ..... N80-19695 #
SAND-79-0869C ..... N80-19643 #

SAPR-2 ..... N80-19213 #

SCF-I-IR(CR)-79-002-PT-5 ..... N80-19721 #

SC5110.18QR ..... N80-19436 #
SC5180.17FTR ..... N80-19254 #

SDSU-RSI-80-02 ..... N80-19583* #

SE-19 ..... N80-19696 #

SER-69060 ..... N80-19063 #

SERI/TR-35-234 ..... N80-19645 #

SETEC-MME-79-50 ..... N80-19248 #

SIT-DL-7-899 ..... N80-19580 #

SK-3 ..... N80-19950 #

SKF-AL79T033 ..... N80-19509 #

SLAC-PUB-2395 ..... N80-19933 #

SORI-EAS-79-267 ..... N80-19572 #

SR-LO-00408 ..... N80-19587* #

SR-1 ..... N80-19689 #
SR-1 ..... N80-19690 #
SR-1 ..... N80-19707 #
SR-1 ..... N80-19718 #
SR-1 ..... N80-19735 #
SR-2 ..... N80-19473 #
SR-2 ..... N80-19945 #
SR-4 ..... N80-19722 #
SR-5 ..... N80-19717 #
SR-6 ..... N80-19709 #

SRI-MP-79-66 ..... N80-19224 #

SSI-2015-F ..... N80-19965 #

STI-TR-1118-1 ..... N80-19085 #
STI-TR-1117-1-VOL-1 ..... N80-19991 #

SU-GL-3023 ..... N80-19518 #
SU-GL-3049 ..... N80-19517 #

SU-IPR-807 ..... N80-19954* #

SU-STAN-CS-79-748 ..... N80-19901 #

SU-TR-86 ..... N80-19682 #

TI-08-79-10 ..... N80-19849 #

TL-653171 ..... N80-19315 #

TM-25 ..... N80-19056* #

TN-1979-21 ..... N80-19327 #
TN-1979-55 ..... N80-19177 #
TN-1979-61 ..... N80-19176 #

TR-EE-79-39 ..... N80-19852 #

TR-EE/EL-10 ..... N80-19444 #

TR-1 ..... N80-19221 #
TR-1 ..... N80-19248 #
TR-1 ..... N80-19272 #
TR-2 ..... N80-19218 #
TR-2 ..... N80-19269 #
TR-2 ..... N80-19276 #
TR-2 ..... N80-19279 #
TR-2 ..... N80-19441 #
TR-3 ..... N80-19904 #
TR-4 ..... N80-19270 #
TR-5 ..... N80-19273 #
TR-5 ..... N80-19908 #
TR-6 ..... N80-19274 #
TR-6 ..... N80-19639 #
TR-7 ..... N80-19210 #
TR-13 ..... N80-19192 #
TR-15 ..... N80-19442 #
TR-22 ..... N80-19955 #
TR-23 ..... N80-19225 #
TR-28 ..... N80-19955 #
TR-79-12 ..... N80-19947 #
TR-149-ONR ..... N80-19736 #
TR-156-SER-2 ..... N80-19918 #
TR-167 ..... N80-19724 #
TR-534 ..... N80-19970 #
TR-672 ..... N80-19986 #
TR-770 ..... N80-19897 #
TR-771 ..... N80-19877 #
TR-801 ..... N80-19850 #
TR-809 ..... N80-19872 #
TR-0079(4451-61)-1 ..... N80-19189 #
TR-014536-78-1 ..... N80-19209 #

TRW-251-028 ..... N80-19441 #

U-79-18-VOL-1 ..... N80-19227 #
U-79-18-VOL-2 ..... N80-19228 #

UCI-ARTR-78-1 ..... N80-19220 #

UCID-18083 ..... N80-19908 #

UCRL-TRANS-11492 ..... N80-19909 #

UCRL-52697 ..... N80-19295 #
UCRL-82790 ..... N80-19959 #
UCRL-83307 ..... N80-19446 #

UCRL-83342 ..... N80-19991 #

UDR-TR-79-32 ..... N80-19242 #
UDR-TR-79-41 ..... N80-19260 #
UDR-TR-79-65 ..... N80-19043 #

UILU-ENG-79-0505 ..... N80-19487 #
UILU-ENG-79-2017 ..... N80-19314 #
UILU-ENG-79-2555 ..... N80-19690 #

UMTA-CA-06-0118-79-1 ..... N80-19990 #
UMTA-CA-06-0118-79-2 ..... N80-19992* #

US-PATENT-APPL-SN-111438 ..... N80-19984* #
US-PATENT-APPL-SN-119334 ..... N80-19237* #
US-PATENT-APPL-SN-119335 ..... N80-19488* #
US-PATENT-APPL-SN-119338 ..... N80-19434* #
US-PATENT-APPL-SN-122985 ..... N80-19489* #
US-PATENT-APPL-SN-122986 ..... N80-19425* #

USAAEFA-77-09 ..... N80-19067 #

USAAVRADCOM-TR-79-32 ..... N80-19080 #

USACEEIA-SEIP-036 ..... N80-19059 #

USCG-D-52-79-PT-1 ..... N80-19058 #
USCG-D-52-79-PT-2 ..... N80-19058 #
USCG-D-52-79-PT-3 ..... N80-19058 #

USNA-TSPR-100 ..... N80-19129 #

UTRC-R79-912985-5 ..... N80-19039 #

UVA/528158/MAE-CE79/128 ..... N80-19802* #

U976 ..... N80-19141* #

VHTRC-79-R54 ..... N80-19743 #

VI-493 ..... N80-19945 #

WP-7819 ..... N80-19075 #

WSRL-0122-TR ..... N80-19032 #

WYLE-TR-631-39 ..... N80-19628* #

Y-2188 ..... N80-19489 #

* U. S. GOVERNMENT PRINTING OFFICE : 1980 311-442/18

PUBLIC COLLECTIONS OF NASA DOCUMENTS

DOMESTIC

NASA distributes its technical documents and bibliographic tools to eleven special libraries located in the organizations listed below. Each library is prepared to furnish the public such services as reference assistance, interlibrary loans, photocopy service, and assistance in obtaining copies of NASA documents for retention.

CALIFORNIA
University of California, Berkeley
COLORADO
University of Colorado, Boulder
DISTRICT OF COLUMBIA
Library of Congress
GEORGIA
Georgia Institute of Technology, Atlanta
ILLINOIS
The John Crerar Library, Chicago
MASSACHUSETTS
Massachusetts Institute of Technology, Cambridge
MISSOURI
Linda Hall Library, Kansas City
NEW YORK
Columbia University, New York
OKLAHOMA
University of Oklahoma, Bizzell Library
PENNSYLVANIA
Carnegie Library of Pittsburgh
WASHINGTON
University of Washington, Seattle

NASA publications (those indicated by an "*" following the accession number) are also received by the following public and free libraries:

CALIFORNIA
Los Angeles Public Library
San Diego Public Library
COLORADO
Denver Public Library
CONNECTICUT
Hartford Public Library
MARYLAND
Enoch Pratt Free Library, Baltimore
MASSACHUSETTS
Boston Public Library
MICHIGAN
Detroit Public Library
MINNESOTA
Minneapolis Public Library
MISSOURI
Kansas City Public Library
St. Louis Public Library
NEW JERSEY
Trenton Public Library
NEW YORK
Brooklyn Public Library
Buffalo and Erie County Public Library
Rochester Public Library
New York Public Library
OHIO
Akron Public Library
Cincinnati Public Library
Cleveland Public Library
Dayton Public Library
Toledo Public Library
TENNESSEE
Memphis Public Library
TEXAS
Dallas Public Library
Fort Worth Public Library
WASHINGTON
Seattle Public Library
WISCONSIN
Milwaukee Public Library

An extensive collection of NASA and NASA-sponsored documents and aerospace publications available to the public for reference purposes is maintained by the American Institute of Aeronautics and Astronautics, Technical Information Service, 555 West 57th Street, 12th Floor, New York, New York 10019.

EUROPEAN

An extensive collection of NASA and NASA-sponsored publications is maintained by the British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England. By virtue of arrangements other than with NASA, the British Library Lending Division also has available many of the non-NASA publications cited in *STAR*. European requesters may purchase facsimile copy of microfiche of NASA and NASA-sponsored documents, those identified by both the symbols "#" and "*", from: ESA - Information Retrieval Service, European Space Agency, 8-10 rue Mario-Nikis, 75738 Paris CEDEX 15, France.

National Aeronautics and
Space Administration

Washington, D.C.
20546

Official Business
Penalty for Private Use $300

SPECIAL FOURTH CLASS MAIL
Book

Postage and Fees Paid
National Aeronautics and
Space Administration
NASA-451

POSTMASTER: If undeliverable (Section 158
Postal Manual) Do Not Return